Operations, Finance and Technology

Section 1 – Operations, Finance and Technology

This section of the report first reviews the general operational, financial and technological circumstances pertaining video communication processes "touched" by the City of Bloomington (CoB). The report then presents recommendations for optimizing or enhancing capabilities grounded in the aforementioned three domains.

This section places considerable emphasis on "quick wins" and improvements within the existing setup. As such it devotes a substantial amount of its recommendations to Community Access Television Services (CATS) as the main "sub-contractor" for the City of Bloomington's video services. A main goal of this section is to further enhance the CoB's video service delivery by helping optimize the capabilities of its principal fulfillment agent. Thus by empowering CATS to further enhance the government meeting documentation process, the City directly improves its ability to facilitate and sustain transparency in the civic process.

CoB – Background

Video content creation at the City of Bloomington may be divided into two distinct domains:

1. Ad-hoc production projects covering diverse subjects ranging from communications by the Mayor's Office to informational videos created by Parks & Recreation.

2. Regular telecasts of government meetings at the city and county level to facilitate transparency and general public information.

The former ad-hoc content displays varying degrees of time criticality and production values. While video recording and editing capability exists within the City, projects are frequently outsourced in part or their entirety to third party providers. Delivery of the final output occurs through the City's website (bloomington.in.gov)

Regular telecasts are handled by Community Access Television Services (CATS) using onsite infrastructure (such as fixed camera and production facilities for the main council chamber) or mobile production kits for smaller meetings (using two Sony Anycast systems available to CATS).

These meetings are telecast on the Public, Educational, Governmental (PEG) channels (CH12 for City, CH14 for County) carried by Comcast in the Bloomington market and are available for streaming from the CATS website.

The CoB ultimately controls all of the community's PEG channel assets/rights and as such CATS and WTIU are "delegated" to operate these channels for the City. Therefore the City of Bloomington could solicit fresh bids for the operation of any of its PEG channels in the future.

CATS – Background

As the main public access operations center for Bloomington, Community Access Television Services is located on the premises of the Monroe County Public Library (MCPL) on East Kirkwood Avenue. CATS is currently responsible for five out of the six PEG channels in Bloomington.

These channels are Comcast #3, #7, #12, #14, #96. WTIU operates the sixth Bloomington PEG channel on Comcast #17.

CATS provides production services to The City of Bloomington, Monroe County and the Town of Ellettsville (ToE) for the regular telecasts of a range of government meetings. It operates and manages the production facilities available to the public for public access productions. These facilities include camera loan kits, a television studio and nonlinear editing facilities for postproduction. Furthermore

CATS offers educational content for example through productions for MCPL and the re-transmission of the SCOLA channel.

CATS operates the playout facilities for the five PEG channels mentioned above and is responsible for providing an archive of government meetings through online streaming at “catstv.net”.

CATS has maintained a stable operating environment throughout the transition to a statewide cable franchise system by being funded through a partnership between MCPL and local government bodies. This arrangement is unlike the setup for many other PEG operations, which had outsourced the provision of production and playout facilities to the cable operator (an option removed by the state wide franchise agreements). In contrast, CATS leverages MCPL resources and funding derived as a percentage (currently 50%) of franchise revenue earned and passed on by the CoB, Monroe County and the Town of Ellettsville (ToE) through a PEG funding partnership.

CATS has found in the past that different parties have shown varying levels of commitment to this funding process. With MCPL, the CoB and ToE being regular contributors while County contributions have shown a shortfall on occasions in the past. However, at the time of writing this report uncertainty over the 2010 contributions by the ToE was evident.

General Impressions and Asset Review

Please also refer to the appendix for a general listing of key assets currently held by CATS.

General Impressions – CATS

Based on site visits and conversations with relevant staff no glaring shortcomings were discovered that would endanger continuity of operations in the short to mid-term. CATS is able to fulfill its mandate as Bloomington’s PEG operations center as is. However, ongoing investment will be required to maintain this status, improve service to patrons (public access producers of content) and meet changing audience expectations.

General Impressions – CoB

The City appears to be able to meet its current video communication requirements through a mix of outsourcing and basic internal work. The former pertains mainly to regular coverage of government meetings (provided by CATS) and high value productions (other providers including WTIU). Internal work is mostly limited to simpler content customization (basic editing and segment extraction) for web publishing purposes. While suboptimal, the current infrastructure seems sufficient to achieve these goals. Exceptions pertaining to file format compatibility issues have been reported. On a departmental level some underused assets (mainly cameras) have also been mentioned by staff, however their existence or usage patterns have not been verified due to the time constraints of this project.

Future investment will likely be driven by an increasing desire of departments outside ITS to project a media rich online presence.

A clear opportunity to enhance internal staff skills cost effectively through sharing / joint development of training resources with CATS exists.

As the City seeks to enhance its own online services by including the recordings of government meetings on its site, the ability to do so depends on CATS providing appropriate permanent links to its content repository. Once established other local government entities would also be able to use this service. Thus its value extends to all members of the PEG funding partnership. The resolution of this issue appears a key priority in the short term.

Upcoming Issues and Concerns (High Priority)

CATS is currently burdened by an aging fleet of VCRs, with a number of units aged nine years and older. Some of the most heavily used machine types are in this category and maintenance incident-frequency and cost are increasing. In the future availability of spare parts at a reasonable price may become an issue and eventually availability of replacement units will become restricted.

This would render a substantial part of the CATS archive inaccessible should it not have been digitized by then. CATS has already partially lost “at-will” access to the sections of its archive stored on reel-to-reel tape. Content recorded on these tapes can only be recovered through expensive outsourced transfer services.

Moreover, in pure economic terms the cost per GB of storage for DV/DVcam tape stock vs. the current generation of ultra high capacity hard disk drives (HDD) is higher by a factor of 10. Thus technical and operational cost factors favor a strategy of migrating away from tape-based production towards file-based workflows and HDD storage.

With a likely heavier reliance on information technology across CATS’s entire production process, information security will become of increasing importance for uninterrupted service delivery. Currently the main obstacle to implementing more effective security measures lies in on-site skills shortage and cumbersome configuration management of client systems.

This report includes recommendations to address these high priority issues outlined above.

Other Issues

Proposals for charging a nominal fee for dubbing archive programs requested by the public for home viewing are currently under consideration. On the one hand, there are concerns among some CATS staff that this fee might deter future program retrieval requests. On the other hand, the dubbing process tends to be time consuming and will be increasingly affected by aging source VCRs. Dubbing currently represents the only means by which the public may request non-governmental archive content.

A future digital archive environment holds the potential for Internet delivery and self-service requests, rendering physical media request (dubbing) the exception, while simplifying the output process for such hardcopies.

CATS (and consequently the City) faces a substantial backlog of yet to be digitized government meetings for the online archive hosted on catstv.net. This has rendered the current implementation of the online government-meeting repository incomplete.

Search behavior for querying the online meeting repository is at times inconsistent and unpredictable reducing the general utility of this service.

CATS has chosen to switch to basic, server-based playout for two of its existing channels, necessitating slightly different content preparation processes compared to its other channels still operating on VCR-based playout. These differences in content preparation have lead to an increase in human errors and additional time spent by staff on error detection and mitigation to ensure operational continuity.

The editing processes currently in place for content produced by the public rely on a fleet of external hard drives to store various client projects. The administration of this fleet of external HDDs is cumbersome and time consuming and negates partially the benefits afforded by non-linear digital workflows.

CATS currently has inconsistent branding across channels and with regards to on-air vs. on-line content presentation, adversely affecting the over-all brand identity.

This report includes recommendations to address these concerns highlighted above.

Accountability

The future CATS in particular will be exposed to a number implementation projects of varying complexity. Some of these projects may be challenging to complete successfully for the organization given that there are currently limited project management resources within CATS. Past IT centric projects seem to have achieved suboptimal results for similar reasons.

The following suggestions may help CATS and its partners improve on implementation success criteria such as on-time and on-budget completion:

- Create organizational project management expertise (please refer to more detailed recommendation further below).
- Develop appropriate and realistic project timeline, and then tie internal fund allocation to project milestones.
- Track project progress and budget as part of regular weekly staff meetings (which are already in place) to maintain momentum and uncover unexpected secondary hurdles as early as possible.
- Use meetings to create a collective sense of ownership for project outcomes where applicable. Habitually perform (blame free) post mortems of project phases to collectively learn from both successes and failures.
- Deliberately commit to phased release of external project funds with funding partners based on the successful completion of individual project segments.
- Proactively seek help within the organization as well as with funding and operational partners to address issues or skill shortages likely to cause project delays.
- Use public, non-monetary rewards for staff that make *exceptional* contributions to project success to maintain moral and inspire emulation by others. Such rewards could be developed in conjunction with staff prior to the project to make them even more meaningful.

The seven suggestions above are not a guarantee for universal project success but address current gaps within the structure of CATS. Developing capabilities around these suggestions should make successful project outcomes for CATS more likely and failures less costly or debilitating.

Alternative Funding Models and Structures

It is acknowledged that the issue of alternative funding models may hold a considerable degree of contention among different stakeholder groups. The aim of the following paragraphs is not to prescribe a departure from the current (successful) funding model but briefly evaluate the feasibility of alternatives, should the existing revenue streams (franchise fees) no longer be available due to (for example) significant changes in the regulatory environment. Furthermore, taxation changes, which are stressing all partners including MCPL, are also appearing on the horizon, adding further worth to this task.

The issue of organizational structure is tied to the assessment of funding models in so far as it impacts the degree of flexibility afforded to an organization in pursuing different modes of financing. But structure will also define the degree of resilience with regards to political challenges, which in turn may impact funding. Under the existing arrangement CATS has operated as a department of MCPL and this setup has thus far stood the test of time. However, any discussion of funding and thus structure would be incomplete without questioning the status quo and exploring opportunities for refining the existing model.

This report is not a policy document and therefore its recommendations with regards to structure and financing are intended to stimulate further discussion and inquiry among stakeholders. The outcome of which must lead to a consensual solution by all parties involved to guarantee successful execution. If such discussions result in no change to the existing structure, the vast majority of concrete

technical and operational recommendations contained in this report may still be implemented without adverse effects on their overall viability.

The following scenarios are not intended as an exhaustive list of options but to promote further discussion among stakeholders to create a certain level of preparedness should such changes appear on the horizon and above all ensure the highest feasible degree of operational continuity for CAST.

The financial needs of CATS, which these scenarios are based on, were derived from a 2010 draft budget provided by the organization as well as a list of past and present operational and capital expenditures from the same source.

The CATS 2010 Budget (Background)

According to the draft budget figures provided by CATS, which are the source of data for this section, the contributions both in cash and kind by the City of Bloomington, Monroe County Public Library and Monroe County total $875,187 for the year 2010.

At the time of writing this report contributions by the City of Ellettsville for the year 2010 were 0. The shortfall was covered by Monroe County. In recent years the contributions by the ToE had ranged from 9,000 to 11,000 dollars approximately, which makes them a comparatively small and thus more symbolic cash inflow compared to the contributions by the other funding partners.

Contributions by the City and County are derived as a percentage of cable franchise revenues collected by these entities. In the case of CoB a 50% share of franchise fees collected during the previous year is passed on to CATS as regular funding. For 2010 this contribution is $354,000 or 40.4% of the total CATS budget (52.7% of total cash contributions), making the CoB the largest total contributor to the funding of CATS.

Monroe County will contribute $216,000 or 24.7% to the 2010 budget.

MCPL contributes a significant amount of funding in kind (about 2/3 of its total contribution of $305,187) providing space and services in the main library building hosting the CATS operations center. For the purposes of determining an “in kind” vs. “in cash” percentage for the MCPL contribution this reports considers all funds used for capital expenditure at CATS, CATS specific personal cost and off-site meetings as well as operational supplies as “in cash”. Space, utilities and office services are considered “in kind”.

Table 1 below provides a breakdown of the amounts and percentage shares of contributions to the CATS 2010 draft budget.

	contribution	of which cash	% of total	% of cash
City of Bloomington	$354,000	$354,000	40.4%	52.7%
Monroe County	$216,000	$216,000	24.7%	32.2%
Library Funds	$305,187	$101,834	34.9%	15.2%
total	$875,187	$671,834		

Table 1 Contributions "In Cash" and "In Kind" to the CATS 2010 Draft Budget (Source: CATS)

Figure 5 visualizes a break down of the three sources of funding for CATS for the year 2010.

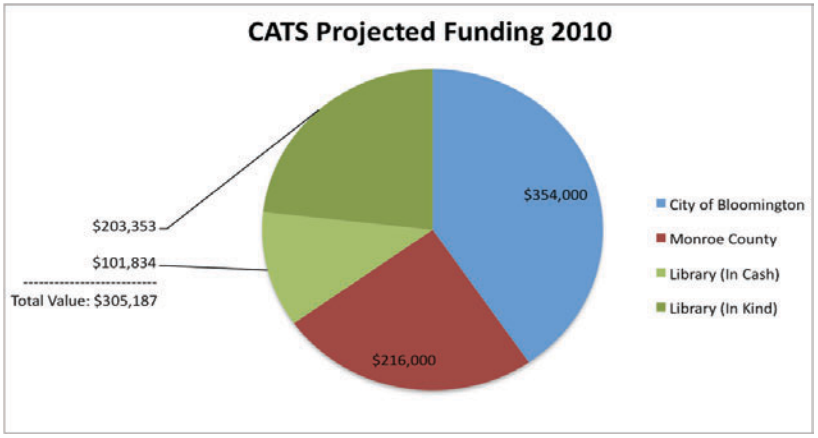

Figure 5 CATS Sources of Funding (Source: CATS)

The largest expense in percentage terms is staffing costs for CATS followed by the in kind contribution of space at the MCPL site. Figure 6 below provides a more detailed break down of the fund allocation in the 2010 draft budget.

The numbers below represent a forecast composed prior to the formulation of this report. In light of the recommendations contained in this report some re-allocations may be necessary. Please refer to the analysis of the likely implications of the recommendations on the CATS operational budget. This analysis provided further below in this report towards the end of section one.

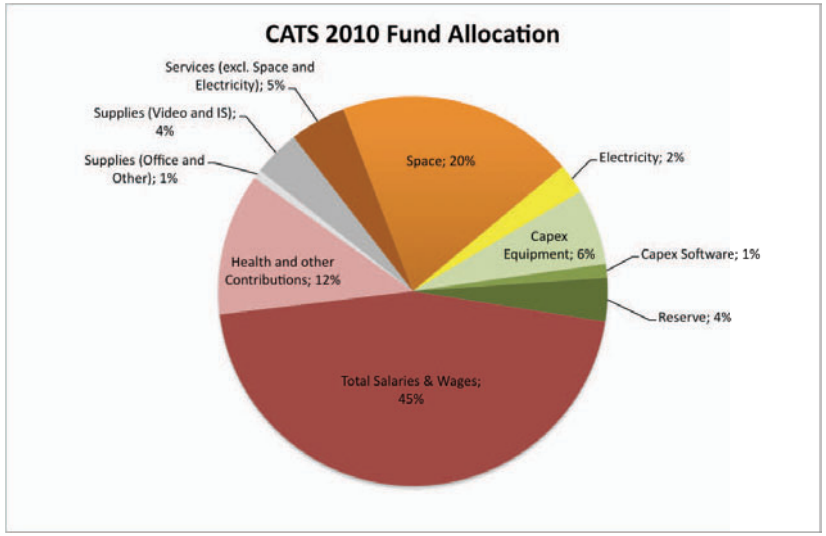

Figure 6 CATS Fund Allocation Based on 2010 Draft Budget (Source: CATS)

Figure 7 below provides a high level summary of the projected actual cash needs (money leaving the system to pay for wages or services) for 2010 to maintain the CATS operations center at current service levels.

The in kind contribution by MCPL, the provision of office space and services is included for comparison.

The capital expenditure number represents the sum of all such items listed in the draft budget but excludes any unallocated funds held in reserve (Approximately $31,000) which may become relevant as funding sources to pay for some of the one-off infrastructure upgrades recommended in this document.

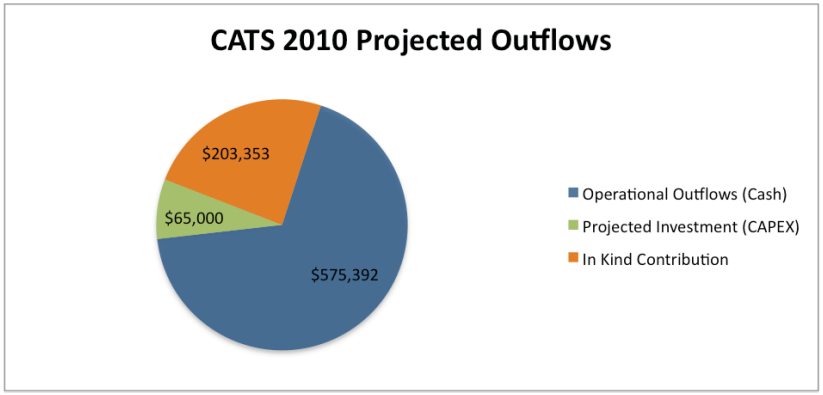

Figure 7 Project Cash Outflows vs. Contributions in Kind (Summary Numbers) (Source: CATS)

Subject to no unforeseen, substantial expenses being incurred during 2010 CATS appears to be adequately funded for this year according to its own budgetary projections.

Credibility of Projections

Historically Monroe County has underfunded CATS compared to the contribution level chosen by the CoB. Since 2009 the County is fully meeting its funding obligations and this is reflected in the projections above.

When taking the long-term average of the funding shortfall by the County compared to the CoB prior to 2009, a hypothetical funding level for the County can be established. Adjusted for historic contributions by the City of Ellettsville the resultant shortfall in the CATS budget would be approximately $53,000 for 2010 under this hypothetical funding level. This shortfall is very close to the sum of the unallocated funds and non-MCPL funded capital expenditure in the 2010 CATS budget (approximately $47,500).

This observation seems to support the assumption that the CATS projections for its operating budget are quite accurate and unlikely to contain significant "padding". By fully meeting its funding obligations the County has effectively created the financial capacity for CATS to invest in its infrastructure while maintaining current service levels.

Note on Cost Structure and Implications

The largest item in the cost structure of CATS represents staffing and related expenses. Thus any forced cost reductions due to a funding shortfall that goes beyond capital expenditure and smaller operational savings (such as recycling tape stock or a complete cut of conference attendance or off-site meetings) will inevitably impact staffing levels.

Given that playout operation through master control is already relatively lightly staffed some management and production roles would most likely be impacted by a forced cost reduction exercise. This in turn would directly impact the level of support available for public producers but more noticeably so the availability of recording services to government bodies for their respective meetings.

As such there could be a connection between the level of funding and the level of government meetings recorded and thus government transparency. This represents a strength and weakness for CATS at the same time. If the public is well aware and appreciative of CATS's role in facilitating transparency in the civic process any cut in funding to CATS would be politically much more difficult to justify. On the other hand, the attendance of CATS cameras during contentious government meetings could theoretically result in retaliatory funding reductions by the respective government body if CATS were perceived to be weak and lacking community support.

The involvement of multiple funding partners (CoB, MCPL, Monroe County, ToE), each with their own financial foundation, thus promotes stability and impartiality by blunting the severity and thus political effectiveness of retaliatory action by a single party.

Subscription Service / Carriage Fee for Cost Recovery

If operational funding were to be exclusively derived by Comcast passing on a channel carriage fee for the CATS output to its subscribers the cost would be as follows. The level of funding is based on the contribution figures listed in the 2010 draft budget provided by CATS (see breakdown above). The total thus excludes any contributions by the Town of Ellettsville.

(NOTE: The costing for the 6th Bloomington PEG channel operated by WTIU has been excluded from these calculations below as its operation is independent from the existence or funding levels of the CATS operations center).

The calculations below are based on an estimates subscriber count of approximately 18,500 households for the Bloomington area (number extrapolated from past known Insight subscriber figures, demographic census data and penetration figures by the National Cable Television Association). A bundled carriage fee for 5 channels spread across all subscribers is assumed.

For the 1 channel cost a hypothetical 30% reduction in general operating cost across the board is assumed. This assumption tries to reflect the fact that master control cost only marginally changes with the channel count. The reduced amount of airtime would most likely lead to fewer government meetings being produced allowing for a smaller building and staffing footprint.

Recovery for complete 2010 funding level:

- Cost per household per month for 5 channels (total): $3.94
- Cost per household per month for 1 channel: $2.76

Recovery for 2010 funding level **excluding** the MCPL contribution:

- Cost per household per month for 5 channels (total): $2.57
- Cost per household per month for 1 channel: $1.80

For comparison, according to the forecasting site "Trefis", MTV commanded a carriage fee of approximately $0.30 per subscriber. Entertainment channels may achieve fees in the $0.70 to $0.80 range (http://www.trefis.com/). The New York Times claims that ESPN used to charge an average of $3.65 per subscriber in 2008 (http://www.nytimes.com/2008/11/25/sports/ncaafootball/25sandomir.html?_r=1). CNN was able to charge $0.47 during the same period (http://www.stateofthemedia.org/2009/narrative_cabletv_economics.php?cat=2&media=7).

In the most expensive scenario this would put CATS at $0.79 per channel per subscriber based on a 5-channel bundle. This does not seem entirely uncompetitive pricing but also clearly indicates that operating a larger number of channels based on the current cost structure is key to the CATS value proposition in such a scenario. At $2.76 for a single channel such a funding model would be much harder to justify.

Commercials

The following calculation assumes four channels (which are directly under the control of CATS in terms of scheduling) and four hours of sellable prime time per channel with 10 minutes of commercials per hour (just below the FCC mandated limits). The remaining daytime advertising would be bundled into any airtime deal for free to entice advertisers due to the comparatively low audience figures. This scenario does not account for the extra cost of a more sophisticated traffic and schedule management system required by CATS to operate the commercial based channels effectively.

Thus: 40 minutes per channel per day, equals 160 minutes of total available airtime for sale per channel per day. This equals 58,400 minutes per year.

Assuming 1 minute slots are adopted for regional content the cost per slot to meet the full contribution level by all 3 partners equals: $15 per slot or half this amount if 30second slots were sold.

At this price level CATS would need to be able to generate at least 1000 impressions for any given spot to be competitive with other cable adverting or local radio (figures may vary slightly depending on which data source is use for CPM values – example: http://infoacrs.com/a/averagecmps.html). Accounting for the included re-runs during the day this would still mean that on average over 5% of viewers of the entire Bloomington cable franchise area would need to be exposed to each spot on a daily basis to justify this price at market rates.

This level of audience reach seems highly unrealistic (although actual reliable audience figures for CATS output are not available). Furthermore, regulatory and other issues might make the sale of spots in between government meetings questionable or difficult. Lastly, it remains doubtful whether the local market could even absorb this volume of advertising at this price point.

Alumni and Extended Bloomington Community

Bloomington is in a privileged position for a town its size by hosting the largest campus of Indiana University (IU). This generates a continuous stream of new residents that will form a connection to this town during their time of study at IU. After graduation this translates into a globally dispersed extended community, far larger than a "conventional" town could hope to generate.

IU claims almost 318,000 living alumni for the Bloomington campus alone (http://alumni.indiana.edu/about/facts/). Assuming that CATS is able to capitalize on its potential status as a link back to the Bloomington community by cultivating its anthropological content archive (reaching back to the late 1970s) and/or offering regular local news and information with special event coverage, a fund raising scenario centered around this extended global Bloomington community could be constructed as follows.

For an annual $5 donation:

- Donors required for full funding: 175,000
- Percentage of alumni population: 55%
- Donors required for non-MCPL portion: 114,000
- Percentage of alumni population: 36%

Given that $5 donation would effectively constitute an access fee to online content (as few would be able to receive the cablecasts) it seems extremely unlikely that such high adoption figures could be achieved among IU alumni. Even a higher fee at 1 dollar a month would still require unrealistically high adoption rates. Standing alone, this funding option does not seem viable for sustaining full-time operations.

IU alumni donations could potentially provide (a small) contribution to a combination of funding measures based on various concepts presented in this report. At this point CATS would directly compete with WTIU for alumni donations, which may complicate and ultimately reduce the viability of this approach further. (WTIU, as the University's TV station is responsible for operating one PEG channel at this point).

Membership Model, Corporate Giving and Individual Donations

PBS affiliates such as WTIU may be able to teach valuable lessons as to how an alternative funding model for a non-commercial television provider like CATS might be structured. A mix of membership-style donations, pledge drives and corporate philanthropy as well as government grants has helped sustain a significant portion of WTIU's operating budget and supported major infrastructure upgrades, such as the transition to HD broadcasting at WTIU.

Based on the publically available audit reports for WTIU for the year 2008 (http://indianapublicmedia.org/static/pdf/FY-2008-WTIU-audit-report.pdf) the station was able to raise $479,174 in individual and $283,248 in corporate and foundation contributions (Total revenues for 2008 were $6.15 million).

A further $268,440 in capital grants by the Department of Commerce and the Corporation for Public Broadcast (CPB) were received for infrastructure upgrades (Operating grants by CPB are ignored for the purposes of this discussion, as this type of grant would be comparable to CATS's financial support by its current funding partners). These capital grants were contingent upon fund matching by the station from non-federal sources.

In contrast, according to revenue figures provided by MCPL, CATS has struggled with declining external revenues from donations and corporate sponsorship over the years (see Figure 8 below). Some of this may be a result of only moderate fund raising efforts on behalf of CATS. The operator has little incentive to aggressively pursue external donations for fear that any gains in external giving could be offset by funding cuts by the government funding partners.

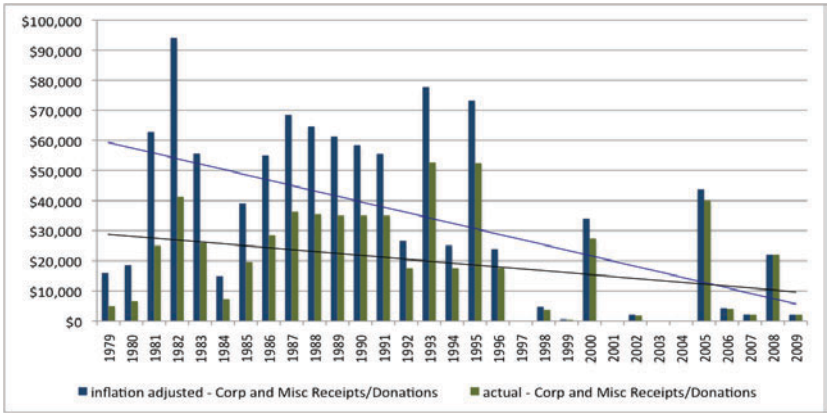

Figure 8 External Financial Contributions to CATS Over the Years (Source: MCPL)

The direct comparison of CATS with WTIU does ignore some important differences that may make an emulation of this funding model as the sole source of revenue for CATS more difficult. WTIU has a substantially larger reach through wider carriage agreements throughout the State and terrestrial broadcasting in the Bloomington area. Furthermore the access to the previously mentioned large alumni population associated with IU offers more leverage and breadth for fundraising activities than CATS could hope to achieve on its own.

WFHB, a popular community radio station in the Bloomington market managed to reach its target of $35,000 for its spring fund drive (the first of two annual fund drives) this year despite the difficult economic climate (http://www.wfhb.org/content/wfhb-listeners-help-station-reach-spring-goal).

A comparison to such contribution levels seems more appropriate than pitting CATS against the fund raising capacity of WTIU. Even if CATS, as a local cable TV station, is able to raise additional contributions from corporate sponsors, an exclusively pledge drive based funding model does not seems viable for sustaining the operation at present service levels given the size of the station's target market.

However, combined with an appropriate corporate structure and suitably secure funding agreements with its existing four funding partners (CoB, MCPL, County and ToE) CATS might be able to leverage a mix of subscription based funding and corporate donations to develop and fund additional services. Such external donations could be used to leverage federal or state based grant funding as matching contributions to pay for major infrastructure enhancements above and beyond those feasible under the existing arrangements.

This makes the membership model best suited for top-up funding rather than base line operational funding.

Grant Funding

CATS has thus far relied on its local funding partnership to meet its financial needs (including occasional minor special project grants by the CoB). However, as WTIU has demonstrated, grant funding can provide an effective tool to for example support major capital projects (see page 5 and 6 of audited annual report by WTIU: http://indianapublicmedia.org/static/pdf/FY-2008-WTIU-audit-report.pdf).

In the near term, CATS should consider pursuing grants that involve "fund matching" to leverage the quality of its locally funded infrastructure investments. This approach would effectively neutralize any incentives for local funding cutbacks that could otherwise offset gains from grant income.

In the long run the experience gained from writing such grant proposal will help open up new opportunities to support more ambitious projects. A daily local news operation in partnership with other Bloomington public media organizations or digital over the air broadcast of PEG channels might either benefit from or be enabled by grant funding derived from "outside" public or private sources. Projects of such scale could otherwise remain out of reach, as they most likely exceed the financial capacity of the local funding partnership sustaining CATS today. Like membership dues, but on a much larger scale, grant funding thus represents a plausible and viable supplement to CATS's existing income.

Please refer to the following resources as a starting point for further inquiry regarding grants and foundations active in supporting media related projects.

- http://foundationcenter.org/ – General resource on grants and foundations
- http://www.knightfoundation.org/grants/ – One of the most prominent foundations supporting media related activities
- http://media.gfem.org/ – A database matching projects with funders
- http://mediaengage.org/ – National Center for Media Engagement – general resource for local and public media activities
- http://www.cfbmc.org/ – Community Foundation, provides local matching grants

Summary Funding Options

The table below compares the various funding options across a range of dimensions. Please note the comparison reflects subjective aggregate assessments and is neither quantitative nor absolute in nature. (Key: $ = small contribution to $$$ = major contribution, ++ = best, o = average, -- = worst)

Funding Method	Assumed Potential Level of Cost Recovery	Operator / Carrier Dependence	Marketing / Brand Dependence	Estimated Contribution % Range if Implemented	Likelihood to Occur	Complexity to Administer	Overall Suitability for Funding OpEx / CapEx
Subscription Service / Carriage Fee (5 Channels)	full	yes	very high	100%	--	very low	+/-
Subscription Service / Carriage Fee (1 Channel)	full	yes	very high	100%	--	very low	-/--
Commercials	$$	maybe	high	50%-100%	-	very high	+/o
Alumni and Extended Bloomington Community	$	no	high	< 10%	o	high	o/+
Membership Model	$	no	medium	< 10%	+	high	+/--
Individual/ Corporate Donations	$$	no	high	< 25%	+	medium	o/+
Grant Funding	$$$	no	low	10% - 50%	++	medium to high	o/++
Share of Franchise Fees	full	yes	none	100%	certain*	low	++/o

Table 2 Summary / Cross-Comparison of Funding Methods Based on Nature and Feasibility

* Subject to regulatory environment

- OpEx = Operational expenditure, day-to-day running costs; CapEx = Capital expenditure, infrastructure/equipment upgrades or purchases
- "Overall Suitability for Funding" only considers the size and relative regularity / flexibility of cash flows generated by the funding method if successfully implemented. It does not reflect the overall likelihood of the specific funding model occurring
- The "Estimated Contribution Range" tries to convey the likely function of a funding method, acting as either full or top-up funding.

CATS as a Self-contained Not-for-Profit Entity

CATS is currently structured as a department of MCPL, although it enjoys great managerial and resource autonomy. The perception is that MCPL has the ability to serve as a buffer for absorbing any direct political pressure that may be put on CATS for either its content or coverage of the political process.

Yet, this arrangement leaves CATS exposed to the risk of interference from within MCPL. Such interference is currently not an issue, but a past library administration has been known to exercise more influence, particularly over budgetary aspects, of CATS's operation.

As the benevolence of the current political climate cannot be taken for granted in the long term, steps could be taken to further strengthen the independence of CATS without depriving it of the benefits of the existing arrangements such as easy access to library resources and services.

While legal advice on the most appropriate future corporate structure for CATS is outside the scope of this report some general concepts and suggested features of such an arrangement are covered in the following paragraphs.

A separate not for profit entity jointly grant funded by the existing funding partnership with additional grant, membership and corporate donation based funding would increase CATS's independence while also offering more creative freedom in terms of raising additional funding for special projects or new services. This approach would put all funding partners on an equal footing and encourage them to act as moderators and joint stewards of CATS.

Such an entity could still receive services as "in kind" contributions from MCPL (much like WTIU does benefit from "in kind" contributions by IU). An official partnership agreement between CATS and MCPL could codify the existing "good will" relationship, helping to preserve a high level of support even during challenging times.

This CATS not-for-profit entity could own all existing assets currently used by CATS (similarly to a holding company) and outsource its staffing needs to MCPL to maintain the relevant employee benefits such as health care coverage, thus leveraging the economies of scale MCPL has to offer in this domain.

The public disclosure obligations for not-for-profits may slightly increase the reporting burden from an accounting and filing perspective but would also serve to further increase and maintain transparency. Both contribution levels by funding partners and the use of funds received would be easily accessible to the public thus helping promote continuity of funding and operational efficiency alike.

However, if CATS were spun out from MCPL to become a self-contained entity new governance issue may arise. Much like a public corporation CATS could benefit from a board. This board would represent the interests of the main funding partners but should also include a representative voice from the general public to help further anchor its interests within the local community.

This proposed board would act both in an oversight and mentoring capacity. CATS management would ultimately be accountable to the board but should also benefit from access to managerial development and outside expertise through board members and their contacts. Furthermore, a strong CATS board could become an asset in promoting and safeguarding the political interests of the PEG operator at the State and even federal level.

Outsourcing of New Services to Not-for-Profit Entity

If the previous concept of turning CATS into its own not-for-profit would be considered too radical a change in the short term, then the following suggestion may provide an opportunity to safely test this concept in the context of service expansion. For example, should CATS decide to venture into digital (low-power) broadcasting for the Bloomington market, emulating WTIU's move in this space, the transmission operation could be outsourced to a separate, dedicated

not-for-profit entity. This entity would own and operate the digital transmitter on behalf of CATS.

The existing funding partners (CoB, MCPL, Monroe County, ToE) may be unable or unwilling to fund an expansion of CATS into (low-power) digital broadcasting. A dedicate not-for-profit transmission provider would be able to solicit membership fees and corporate donations as well as leverage federal grant funding to pay for such an investment. Given that many federal grants require fund matching from non-federal sources such a separate entity would have much stronger incentives to proactively raise funds from residents and corporate sponsors. Such an organization could also enter into a resource sharing agreement for the tower infrastructure with WTIU or WFHB to realize further cost savings.

A similar approach might be taken to operate and fund a significantly upgraded master control for providing HD playout services in the long-term future.

Should CATS itself eventually become its own not-for-profit the existing transmission tower or master control operator could be merged with this new CATS organization if so desired.

Arguably there may be both legal and political intricacies to such proposals that this high-level concept fails to consider. The level of due diligence to decisively recommend or dismiss the above recommendation exceeds the scope of this report and as such it merely represents a suggestion to initiate further discussion.

Long(er)-Term MOU, Codified Funding Ratio and Special Project Micro Funding

The funding partners could consider guaranteeing a certain base level of funding to CATS (within a reasonable range) for periods longer than one year (the current funding cycle). Given that the funding partners also operate on annual budget cycles absolute funding guarantees may be challenging to implement.

Instead a minimum percentage of franchise revenues, with a provision to renegotiate should exceptional expenses be incurred by the funding partners (such as major disaster relief costs), might be a more feasible instrument. This percentage could be guaranteed through contract or local legislative measures.

Under any extended funding agreement CATS should be required to meet specific performance measures in return for the increased financial stability. The nature of such performance measures could be a combination of the following elements for example:

- Pre-determined project milestones for the capital investment schedule of CATS
- New service offerings successfully launched
- Quantity/progress of archive digitization

The goal of such performance measures would be to encourage CATS to engage in more long-term strategic planning with regards to its investment needs and service development.

Such a base funding agreement could then be combined with provisions to specifically exclude any external funds raised for capital projects from any future funding decisions. While such a provision may rely on a certain degree of mutual trust by the parties to be fully effective, it could serve to revitalize external fundraising efforts by CATS. Such efforts could enable a faster execution of projects and infrastructure upgrades, thus positively leveraging the public investment in CATS.

External fundraising efforts could cover programs such as “adopt a VCR” to encourage members of the public to underwrite the maintenance cost for a certain period of time for one of the ailing machines in master control. Or such efforts might involve PayPal enabled online donations on the CATS website to fund the acquisition of a new video server. The online nature of such efforts could also aide transparency of fund use by showing a progress bar towards the

funding target or subsequent stories and pictures documenting the project execution, such as the installation of the new video server.

These measures might help improve local involvement and contributions, as well as further increase a sense of ownership in CATS by the Bloomington community.

Concluding Remarks on Alternative Funding and Corporate Structure

If pursued, the goal of any changes to the current arrangements governing the funding and operation of CATS should be to promote:

- Long-term continuity of service
- Continued editorial independence and impartiality
- Increase accountability of funding partners to meet their commitments
- Incentivize and reward innovation at CATS
- Leverage public and private funds/grants to maintain a relevant service offering

With these parameters in mind the following solution seems most viable in the long-term should the existing arrangement no longer meet the needs of CATS and its funding partners.

- Independent not-for-profit CATS with base-line funding through operational grants by the existing funding partners
- Operational grants are tied to mutually agreed performance metrics
- Operational grants may be cash or in-kind contributions
- Assets owned by CATS but staffing outsourced to MCPL to protect employee benefits
- Establish diverse oversight board for CATS to represent the interests of the main funding partners as well as the general public to the management of CATS
- Board to advocate for the interests of CATS at the State level and act as conduit for mentoring and managerial development of CATS management
- CATS free to pursue additional grant funding for capital projects and raise matching funds from private and corporate contributions

Good governance, a stronger incentive structure, clear performance goals and a supportive environment to help achieve such goals, should create a CATS that is more agile as an organization. This should enable CATS to continue to fulfill its PEG mission while actively engaging new audiences beyond the traditional cable television paradigm.

Such an agile PEG operator with a well-run and relevant service portfolio would be best placed to attract continued long term funding by local government. Furthermore, should future City governments seek new bids for the operation of one or more of its current PEG assets, a strong and dynamic CATS would likely emerge a winner in this process.

Note on Maintaining the Existing Structure

While the preceding items have presented a range of alternative funding options and organizational structures, some more viable as dominant sources of funding for CATS than others, it should be noted that the existing structure is not an obstacle to general innovation at CATS.

In the public eye, it does endow CATS with the notions of impartiality, neutrality and the authority commonly attached to a public library. These benefits are significant but by no means exclusive. A strong CATS brand backed up by a matching operational record of

impartiality could project such values effectively and maintain the public's trust and respect. The favorable perception of PBS seems to support this hypothesis on a national scale (see: http://www.pbs.org/aboutpbs/news/20090213_pbsropersurvey.html).

The one benefit of being part of MCPL that would be most difficult to replicate for an independent CATS is access to experienced council to defend itself against litigation or acts of legal intimidation.

Given its successful record spanning three decades of PEG operation, CATS as a department of MCPL can be considered a proven formula thus far. As the pace of technological innovation continues to accelerate and the media/provider landscape changes alongside, it remains for all stakeholders to regularly asses as to whether the structure of CATS, current at the time, is still the most appropriate one going forward.

CATS and Its Environment

CATS the Visual Brand

As a general observation CATS seems to have focused on technical and operational execution in recent years. CATS has undoubtedly excelled at this by offering uninterrupted quality PEG services since the late 1970s.

Far less attention seems to have been given to promoting public awareness of its operation. As a result the individual channels lack a strong visual identity or consistent style templates for on-air graphics elements and their placement.

The CATS online presence employs rudimentary web design and has esthetic and usability shortcomings in its current form. No discernable connection between the television channels and the website seems to exist other than the common use of the CATS and channel logos. As a result no overall design language exists to create a coherent brand identity across delivery platforms.

In an age of increasing visual sophistication these shortcoming may undermine the overall perception of CATS and its output and dissuade some demographics from even engaging with the channels or website.

Recent years have seen sufficient advances both in postproduction software as well as webhosting technology to easily address these matters without spending vast sums in the process. CATS employs a team of creative and talented professionals that would be easily capable of creating and implementing a common station identity across TV and online services. Some of the recommendations contained in this report aim to create capabilities that will help CATS more easily execute such a cross platform identity.

However, the visual identity of CATS and its output is only one tool for increasing the organization's brand value and general presence within the local community.

Promote Compelling Visual Expression

CATS has the potential to occupy a central place in Bloomington's social fabric by enabling local contributors to express their ideas and thoughts in a compelling way. Public access programming and video sharing site uploads alike (such as to YouTube) showcase the diverse skill levels of their contributors.

Owning a word-processing program and a computer will neither make anyone instantly literate nor automatically transform people into great authors. Equally, having a camera and editing software at ones disposal will not automatically transform one into an engaging and compelling storyteller, capable of tapping into the rich methods of expression the video medium has to offer.

High Touch Training

CATS is in a unique position to have both the human and technical resources available to help public contributors become better at expressing their ideas and ultimately create more engaging, powerful and exciting content. To achieve this goal requires no editorial input by CATS, which would run contrary to the free speech principals

underpinning public access programming, but does require an enhanced support structure leveraging new processes and technology.

CATS could develop the skill base of producers of all experience levels by providing additional online resources for training public contributors, having staff available electronically to answer questions during a shoot, by potentially offering a moderated discussion space for likeminded individuals and actively supporting and monitoring the technical aspects and progress of the editing process.

The technical and operational recommendations of this report would help facilitate such a higher touch approach without increasing the total workload of staff. If public access is about the free expression of ideas CATS should ensure that the impact of such ideas is not blunted by lack of skill or perceived barriers to engagement.

Engage IU Program Makers

While transient in nature, IU harbors a pool of committed and enthusiastic program makers scattered across the various schools such as Journalism and Fine Arts. WTIU does not seem to be able to fully capture the output of this community either due to operational or policy barriers. CATS could fertilize and expand its own contributor base by intermingling both IU students and local producers within its production community. Here for example relatively unbureaucratic access to TV studio infrastructure compared to WTIU represents one of CATS's main advantages in this domain.

Outward Projection of CATS and The PEG mission

The above points mainly relate to audience engagement and the creation of value by CATS for its viewers and contributors. The following elements propose measures that would help CATS create a higher positive profile in the community and political landscape surrounding it. The measures could help maintain CATS's strong foundations and ultimately secure continued access to funds and services against the backdrop of an ever faster evolving and changing social and media landscape.

PEG Content Exchange

Deploy a professional content exchange platform to share programs with other PEG providers and government institutions in the state. This can be a tool to create appreciation for and awareness of the PEG missions among decision makers while facilitating new social and professional connections useful to CATS.

Lobbying Decision Makers

By actively engaging key political decision makers beyond the Bloomington area in a positive way CATS could lead the way among PEG providers to strengthen their cause. Such engagement may require creative methods or even guerilla marketing tactics to create the desired attention and positive mindshare within State Government and some of it may ultimately still be ineffective against financial lobbying practices. Yet to date CATS seems to have failed to effectively exploit opportunities in this space or expand beyond well-established connections. As those parties less sympathetic towards the PEG mission continue to operate assertively in this arena, CATS can ill afford to continue taking a passive observer's position on the sidelines.

Self-Promotion

Surprisingly little self-promotion can be found on CATS's channels and web presence compared to other TV operators. Given the highly valuable contribution it potentially brings to the local community from enabling compelling story telling to facilitating transparency in local government CATS fails to proactively educate its audiences about its mission. Based on the interactions with various constituents during the creation of this report it is evident that there is a section of Bloomington society that is clearly aware of and appreciative of the value CATS adds to their lives. Yet anecdotal evidence, for example from the survey commissioned for this report (see section 2 of this document), also seems to suggest that many average residents are only partially aware of the wide range of functions performed by CATS.

As with the lobbying activities discussed previously, CATS is leaving potentially powerful lines of support untapped and underdeveloped. The very benefit of developing and cultivating such lines of support lies in their strategic value as supports for its independence.

Leading in the PEG Community

Decisive actions to project a positive and strong image of CATS across the state of Indiana could also help develop CATS as a leader of the remaining PEG community in the state. In doing so a positive feedback loop could be created to increase the power and effectiveness of advocacy for causes affecting CATS and the wider PEG community. The clarification of the current regulatory status with regards to the franchise fee obligations and quality of carriage by AT&T for its U-verse service represents such a cause that could benefit from unified action by the PEG community and its supporters.

Emphasize High Value Items in Schedule

Where possible high value items should be promoted and clustered strategically in the CATS schedule during morning and primetime viewing to help grow engagement beyond existing audience demographics. It is acknowledged that such actions should be mindful of the free speech nature of public access programming in particular and thus not lead to discrimination against unpopular topics.

Positively Engage Comcast

Arguably this may be a goal that could prove difficult to achieve. However, once CATS has increased its political network and raised its profile in the local community as well as across the State even further, new avenues of engagement for Comcast and other content platforms could be created. In an increasingly centralized and homogenized environment the value of local content holds the same premium potential as organic farmers' markets do in the food industry. Leveraging this potential to CATS's advantage may represent one of its greatest challenges and opportunities for the coming years.

A Mindset for Success

The vision outlined in the paragraphs above depends on two fundamental components, the tools available to CATS (technical and operational processes) and the people putting them to work.

CATS will, by implementing the recommendations in this report, refine its toolset to such a degree that people will become the only variable in deciding its future path.

CATS has a skilled group of professionals on its staff, many with over a decade of experience in TV production work. This represents a tremendous asset in the quest for achieving a more agile and proactive organization as outlined above. During the research portion for this report staff repeatedly voiced their excitement about evolving both technologically and operationally, demonstrating the openness for change so frequently lacking in other organizations.

However, sustaining and channeling this enthusiasm might prove a more difficult management challenge. Some of the following observations may help define a starting position from which to tackle this challenge.

As increases in cable subscription fees have outpaced inflation in recent years franchise revenue and in turn funding available to CATS has risen proportionately.

At the same time the general position of public access TV as a medium of free speech has slowly been declining from its heyday in the 80s as blogs, video sharing sites and other technologies have encroached upon its territory.

The cable industry has seen massive consolidation, creating a drive for unified national infrastructures built around leveraging commonality and economies of scale. Moreover, this process has also removed decision makers within the cable industry from their local communities. All of which has been less than beneficial for the relationship with and acceptance of PEG providers.

Against this backdrop a slight bunker mentality or introspective stance, focused on preservation rather than expansion, seems to have taken hold within CATS. Managing for continuity and service provision in a less than optimal external environment with funding not implicitly tied to any specific performance metrics may have removed the "sense of

urgency" a market based organization might have felt under similar circumstance.

Combined with a funding shortfall over a number of years this in turn may have dampened the drive to question, innovate, and transform. As increased funding became available much needed infrastructure upgrades were pursued but largely within the established context.

Its privileged position of relative independence within the MCPL departmental structure seems to have also undermined the overall identity of CATS. The effective decoupling of some staff from the MCPL email system does not only represent an inconsistent approach to business communication but may convey, probably unintentionally, a lack of pride in being affiliated with CATS. An alternative approach that conveys independence but strengthens CATS's identity would be to have everyone use catstv.net email addresses consistently.

As industry and public sector alike compete for audience attention and engagement in an increasingly crowded market space, innovative solutions that leverage traditional strengths and re-frame past conflict are needed for survival.

CATS will need to create and sustain a new sense of urgency and focus within its organization to successfully implement such solutions and maintain a proactive outward looking rather than defensive inward looking stance.

The individualistic departmental autonomy should give way to a more team oriented decision-making process at the management level.

Adopting a formal project definition and management process with individual commitment to and accountability for delivery (within the public forum of the team) would form part of this process. Similarly, once the technical capability exists, a common set of principles from security to methods of contact should be adopted by which all members of staff and management abide. A management culture that strives to confront and resolve issues contrary to those principles and supports the interest of the team needs to be cultivated at all times.

In an ideal scenario the compartmentalized office spaces currently in use should be consolidated into a more collaborative, shared environment (although this may not be possible within the current space constraints). Absent this physical collocation, increased asynchronous collaboration in the virtual domain (online) should be promoted wherever possible.

Project funding and general funding should be tied to milestones and realistic, achievable goals, both for technical and operational transformation, to foster a sense of urgency.

The public relations element driving engagement with audiences, contributors and partners might require the creation of a dedicated position within the organization (See relevant recommendation below). To make this expense worthwhile the role should be integrated on an equal footing with the rest of the core management team.

Underpinning all of this a new degree of organizational self-awareness, more akin to a venture funded start up rather than a government department is needed. Above and beyond the steps suggested here and in other recommendations contained within this report, the funding partners themselves should seek to foster and support this mentality in words and deeds wherever possible. This may be done by promoting transformation, supporting skills transfer/development and creating safe spaces for experimentation and exploration. A strong and healthy CATS will be a key asset in helping grow and support the strong and vibrant communities the funding partners desire and work for.

Statement about HD and 3D

With the adoption of digital broadcasting high definition (HD) TV transmissions have become ubiquitous. Digital cable and satellite providers use the number of HD channels on their platforms as a means of differentiations in their advertising and consumer camcorders are now almost universally HD capable.

WTIU already offers HD content on its own (non PEG) channel platform through digital cable and local digital broadcast in the Bloomington area.

These trends may create subtle pressures on CATS to offer HD content and raise questions about infrastructure upgrades to support its production.

All of CATS's PEG channels are currently carried on Comcast's analogue cable tier and thus limited to standard definition (SD) resolution and susceptible to picture degradation inherent in analogue transmissions. Thus content produced in HD would still only be experienced by viewers in SD resolution, with no discernable difference to conventional SD originated content. Until Comcast discontinues its analogue cable transmissions and/or migrates the PEG channels onto its digital tier, HD transmissions are not accessible to CATS. Based on the FCC requirement for cable operators with analogue customers to effectively continue analogue service provision until 2012 (subject to future FCC review) (see: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-276576A1.pdf and http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07-170A1.pdf see page 7 of this document) a full digital transition by Comcast is most likely after that date. However, recent marketing communication sent to residential cable customers indicates that Comcast is seeking to become an all-digital provider by the end of 2010.

However, if CATS were to give up its analogue spectrum on the Comcast infrastructure, negotiations should include provisions for HD channels on the new digital tier. This may be justified since CATS would be vacating rather valuable assets. Based on current compression technology the channel bandwidth/spectrum occupied by one analogue TV channel could carry at least 2 HD channels or several digital SD channels. Thus, in its current form CATS occupies enough cable spectrum to digitally transmit up to 10 HD channels or potentially 25 or more digital SD channel. During a digital migration this tradeoff should be reflected in any new arrangement and thus provide access to HD telecast capacity. Given the uncertainty about the future conditions and legal foundations for a digital migration of cable services a good working relationship with Comcast seems highly desirable.

In the mean time online delivery may eventually provide an easily accessible outlet for PEG HD content, although currently many "so-called" HD streaming services still only provide resolutions comparable to standard definition broadcasts. Slowly, as network infrastructure improves, some services, usually backed by powerful content delivery networks, have started to offer true HD resolution for streamed Internet video. Irrespective of the network bandwidth, such material is also comparatively resource intensive to decode on a PC and thus requires up to date hardware to be truly usable.

Lastly, subject to funding and regulatory issues being resolved, CATS could pursue digital broadcasts in the Bloomington area. However, the nature of the current ATSC digital broadcast standard would push the limits of existing compression technology to accommodate one HD and four SD channels on one transmission channel/multiplex at acceptable quality levels.

Either cable or broadcast based digital HD transmissions would also require significant and expensive investment into the current master control environment to reliably play out HD content.

Against this backdrop of technical limitations an immediate large-scale upgrade to live HD production seems of little value for CATS.

Non real-time content may be progressively and relatively inexpensively switched to HD acquisition over time as existing camcorders are replaced. Most editing software available to CATS already supports HD recordings by such camcorders. Please refer to the relevant recommendation on camcorder acquisition further below for suitable configurations and recording resolutions. With this approach SD version of a program could easily be created as part of the final delivery process and HD versions could be archived for future use in any forthcoming HD service.

Real-time or live content such as government meetings would require more costly infrastructure upgrades covering cameras, vision mixers,

character generators, transmission links, recorders and down converters (for SD broadcast). At current price points such equipment would be hard to justify against the marginal benefit of seeing speakers' faces in higher resolution. The need for better resolution for projected documents during meetings could be addressed more cost effectively by including these document files (for download) with the online streams available through the CATS archive on the catstv.net website.

Furthermore, HD presents entirely new challenges in terms of talent preparation as skin imperfections become clearly visible in the picture. Such drawbacks might actually discourage more image conscious public figures from appearing on live HD telecasts under certain circumstances. While certainly not a key factor, such human aspects also warrant consideration when gauging the pros and cons of transmitting government meetings in HD (especially considering the cost involved in doing so).

3D TV is an emerging domain that is still in its infancy. Beyond selected sporting events and some live performances the broadcast-use of 3D is limited to transmitting feature films specifically produced for this medium. Several TV stations/networks are currently experimenting with this medium, using digital HD transmissions to carry the content and a small but growing number of consumer devices are able to display the material in the home. 3D streaming over the Internet has also been demonstrated successfully. However, editing 3D content is still challenging and inexpensive acquisition devices are not yet readily available.

The viability of 3D content production for CATS is directly tied to its development of HD capabilities and would as such represent the next step beyond HD. Its adoption for mainstream programming does not seem viable within the 5-year timeframe covered by this report.

Explanation: Recommendation vs. Advisory

The following sections contain recommendations and "advisory" notes for both the CoB and CATS. The difference between these two items is as follows.

Recommendations: Generally refer to specific actionable workflow changes, infrastructure investments or services that warrant definite attention.

Advisory items: Are lower priority issues that ought to be considered by management as part of day-to-day operations going forward. These items are often included to prompt a general review of policy or acknowledge and re-iterate known general issues.

Recommendations for the City of Bloomington

The recommendations below cover the current needs of the City in the video production domain. Potential future services are discussed in section 4 of this document. A guide outlining the interdependences between the various recommendations can be found in the appendix.

Install QuickTime Codec Pack / Transcoding – Advisory

Install an extended QuickTime codec pack such as Perian (www.perian.org) on machines using iMovie to increase format import capabilities. A quick survey of various news groups reveals that Perian should always be installed in the "available to all users" mode to ensure maximum compatibility with iMovie.

If the CoB were to up upgrade a QuickTime license to QuickTime 7 Pro (see: http://www.apple.com/quicktime/extending/ - Cost: $29.99) as part of its general IT investment activities, enhanced export and transcode capabilities would be gained independently of iMovie or other editing software thanks to the above codec pack.

Another useful application to consider is "Handbrake" (http://handbrake.fr/), an efficient transcoding tool, which also offers excellent DVD extraction capabilities for non-encrypted DVD content. Handbrake may be used to repackage files into iMovie friendly container file formats.

The combination of the two measures above should enable reliable Mpeg2 import capabilities in iMovie.

Cost: Free (products are open source or free ware) / $29.99 for QuickTime 7 Pro license key

Expand Video Production FAQ – Advisory

Extend the current FAQ pages to include advice on how to import file based content with particular reference to the use of Perian enabled workstations and DVD extraction based on Handbrake.

Based on conversations with staff it seems that some users tend to either forget or are unaware of suitable steps to get their content ready for editing, especially when this content is file rather than tape based.

Cost: Internal Labor

Pool (Online) Resources for Video Production Training with CATS

As CATS potentially embarks on a project to provide video related training resources online to their staff and public producers the City could benefit from pooling/merging their online training content with CATS. CATS seems best placed to provide such resources in combination with the practical training exercises (e.g. Showers Control Room operations) already provided to CoB staff.

Content ownership should be on equal perpetual licenses for both parties contributing to the training repository.

The City should also consider formally adding this training and resource development function to its annual funding agreement with CATS to promote consistent quality of service.

Cost: Internal / CATS effort

Advanced Video Editing Software

iMovie, the video editing application primarily used by the City is limited in its capabilities. More complex productions require a disproportionate amount of time and effort to complete within the limitations of this software. This view is also echoed by comments from CATS staff observing public producers working with this application.

Once it is determined that the City has outgrown iMovie a switch to Apple Final Cut Express should be considered. This software is highly similar to Final Cut Pro but significantly cheaper. It lacks the Final Cut Server integration of the "pro" version and has limitations on the

amount of content layers available in the software, but overall should be sufficient for the needs of the City. A key benefit of this switch would be that the City could draw on a large pool of CATS staff capable of providing user support for the software. Such a service could be included as part of future MOUs once needed.

Cost: $199 per license of Final Cut Express (http://www.apple.com/finalcutexpress/)

Universal Web-Delivery Standard for Video

Define universal encoding and delivery format specification for all future City video projects. Once a standard has been defined all projects, regardless whether completed internally or by external contractors, should contain a binding requirement to deliver a version of the program in the prescribed file format with the relevant coding specification(s).

Standard City procurement contracts, where applicable, should be updated to reflect this requirement. The standard should also be published as part of the internal online training resources and publicized to those dealing with video as part of City communication efforts.

Options to consider for this standard:

Codec/Container

- Flash Video (Flash licensing, potential codec licensing)
- H.264* (MpegLA licensing)
- Ogg-Theora (Open Source)
- On2 VP8 (Subject to future actions by Google)

*H.264/AVS also Mpeg4-part 10 has been chosen over Mpeg4-part 2 (which is popularly often referred to simply as Mpeg4) due to its greater coding efficiency and HTML5 relevance.

It should be noted that Flash video could act as a container for a range of compression codecs including H.264 and other flavors of the mpeg4 specification. Flash based delivery simply allows easy playback of embedded video files on websites given the almost universal market penetration of the flash player. However, with the advent of HTML5 the need for such an embedded player platform could go away. While HTML5 currently does not prescribe a definite video codec, some unfortunately mutually incompatible, approached have emerged among browser manufacturers.

- Safari supports HTML5 video in H.264 only
- Opera and Firefox support Ogg-Theora only
- Google Chrome supports both Ogg-Theora and H.264
- Crucially Microsoft* currently does NOT support HTML5 video at all for their browsers without the use of the Google chrome plug-in.

*Microsoft's forthcoming IE9 will support H.264

YouTube is currently demoing a flash free version of YouTube based on h.264 (the same codec used for large quantities of its flash based content).

Apple cites concerns about intellectual property rights claims that might surface in the future as a reason for not implementing Ogg-Theora. (http://infoworld.com/d/developer-world/browser-vendor-squabbles-cause-w3c-scrap-codec-requirement-974) (http://www.theregister.co.uk/2010/04/30/steve_jobs_claims_ogg_theora_attack/)

Whereas H.264 carries the risk of future licensing costs increases. Currently video content for free web-streaming purposes (internet broadcasting) is license free until the end of 2015

(http://www.mpegla.com/Lists/MPEG%20LA%20News%20List/Attachments/226/n-10-02-02.pdf). If the current general licensing approach continues and fees would be imposed after this date, the cost would be based on the audience, based on a relative comparison to free to air broadcast markets.

"….after the first term the royalty shall be no more than the economic equivalent of royalties payable during the same time for free television."

"For (b) (2) where remuneration is from other sources, in the case of free television (television broadcasting which is sent by an over-the-air, satellite and/or cable Transmission, and which is not paid for by an End User), the licensee (broadcaster which is identified as providing free television AVC video) may pay (beginning January 1, 2006) according to one of two royalty options: (i) a one-time payment of $2,500 per AVC transmission encoder (applies to each AVC encoder which is used by or on behalf of a Licensee in transmitting AVC video to the End User) or (ii) annual fee per Broadcast Market12 starting at $2,500 per calendar year per Broadcast Markets of at least 100,000 but no more than 499,999 television households, $5,000 per calendar year per Broadcast Market which includes at least 500,000 but no more than 999,999 television households, and $10,000 per calendar year per Broadcast Market which includes 1,000,000 or more television households." (Source for both quotes: (http://www.mpegla.com/main/programs/AVC/Documents/AVC_TermsSummary.pdf)

The uncertainty in this context arises from the method used for market sizing. In the context of Internet based broadcasts the entire planet could be classed as the "potential market". Alternatively the market size could be taken as analogous to the size of the cable market currently served by CATS. The implications for licensing cost for either classification are significant.

Based on the time frame for establishing a standardized delivery format for CoB online content, H.264 for flash delivery in the short term and HTML5 delivery in the mid-term represent the options compatible with the largest share of the browser market. If suitable user demand manifests, the patent uncertainties surrounding Ogg-Theora are resolved and/or H.264 becomes costly to license high quality H.264 videos could be transcoded into any new standard accordingly.

Lastly, it remains to be seen how Google decides to use the intellectual property portfolio surrounding On2's VP8 codec (On2 claims superior compression quality compared to H.264 at a given bitrate. See: http://www.on2.com/index.php?599). Google recently completed the acquisition of On2 and its patents. Speculation about the future use of VP8 patents range from closed licensing for TV and IPTV applications to open sourcing the codec as the new universal Internet video standard. At the time of writing this report no official statements had been made by Google on the matter and as such the above scenarios remain purely unsubstantiated speculation.

The city may chose to outsource the hosting and streaming of video content not hosted by CATS to services such as YouTube or GoogleVideo. Note many services (such as Vimeo) have specific clauses that ban any commercial or political content from their sites. Generally the hosting site is granted a perpetual, irrevocable license for the uploaded content.

Hosting with 3rd party services may incur a cost if large amounts or long sequences of content are published on a regular basis. The reliance on a third party for content availability could be partially mitigated by diligently retaining backup copies of all content published.

Each service has recommendations in terms of video resolution and coding for source material. The CoB may draw on these recommendations for their own locally hosted content to match user's quality expectations, which most likely have been defined through such services.

The following recommendations are based on YouTube. The CoB may offer the different quality levels through in player user choice.

- Video: 320x240 pixels, Flash 7 at 250Kbps target bit rate; Audio: mp3 22.050 KHz, monophonic at 64Kbps

- Mobile Video: 320x240 pixels, H.264 at 400Kbps target bit rate; Audio: mp3 22.050 KHz, monophonic at 64Kbps – Use baseline video profile (BP) up to level 3.0
- Video: 480x360 pixels, H.264 video at 700Kbps target bit rate; Audio: mp3/aac-lc 44.1KHz stereo at 128Kbps – Use baseline profile (BP) up to level 3.0 or with low complexity audio profile for mobile devices
- Video: 1280×720 (720p) pixels, H.264 video at 1024Kbps target bit rate; Audio: mp3/aac 44.1KHz stereo at 232Kbps
- Frame rates should either be 30fps for video content or 24fps for film originated material or HD material shot at this frame rate. Frame rate conversion should be avoided where possible
- Use MP4 file format for mobile devices if possible

NOTE: The video and audio encoding settings suggested for mobile devices assume a recent generation smart phone such as the Apple iPhone 3Gs, Blackberry Bold, or current Windows Mobile or Symbian device (The latter two may require 3rd party player depending on their implementation).

While the mobile specific video file formats 3GPP and 3GPP2 may cover a larger handset range including more basic devices, the historic split between GSM and CDMA based devices, with the latter mainly using 3GPP2 over 3GPP, creates administrative complexities for mobile content provision that the CoB should aim to avoid.

Due to the varying levels of implementation and handset capability, testing of H.264 encoding profiles on the target platforms is essential.

Cost: Free if hosted locally (currently / use existing flash licensing for production), for outsourced hosting with clip length restrictions (10 minutes) by e.g. smugmug.com for $150 per year;

HTML5 Support for City CMS – Advisory

In the mid-term the CoB web content management system "City CMS" should be adapted to fully support HTML5 features such as the "<video>" tag to allow for easy "player less" hosting of video content.

However, until the codec uncertainties discussed in the recommendation for the "universal web-delivery standard" above have been settled and Microsoft Internet Explorer (a browser that currently still commands between 50 and 60% market share, depending on which data sources are used to calculate this value) supports either of the "<video>" tag implementation options, large-scale deployment seems unwise. (According to latest statements by Microsoft the forthcoming IE9 will only support H.264 for HTML5 video. See: http://blogs.msdn.com/ie/archive/2010/04/29/html5-video.aspx).

It seems likely, based on assessing the current industry discussions, that HTML5 will eventually become universally supported. The extra lead-time afforded by the current debate about codecs should be used to test a potential implementation thoroughly. Sites like "YouTube" and "Dailymotion" are running HTML5 versions of their sites in beta mode. The former is based on H.264 and the latter uses an Ogg-Theora implementation of HTML5 video. The city could engage in a small pilot deployment of its own to test and trouble shoot its own implementation in City CMS in the mean time.

Cost: Staff effort

Central Video Project Storage

Establish a central networked repository for CoB video content that is not covered through the arrangements with CATS. Currently the final output of various production efforts by different City departments is stored on a range of media such as DVDs and external hard disk drives, distributed across a range of locations. This makes fast access to this content for repurposing or publication difficult.

The central repository would mainly lower "barriers of access and use" rather than serving a specific operational need, such as for example

better facilities use. The goal would be to facilitate easier access to video material produced by the City in its totality for ad hoc use in various publication efforts.

The repository could be a simple folder structure on a networked file server initially.

Cost: Server storage space / Part of normal IT budget

Metadata Working Group

Determine the City specific metadata requirements for content to be archived through CATS. The value of this exercise lies mainly in enabling better search capability for CoB content in any future archive system.

The process could be simplified by reviewing the CATS metadata specification for the CATS Archive Preservation System, once completed by CATS, and propose any additions as/if needed.

Cost: Staff effort only

MOU for Peg Channel Delegation – Advisory

Develop a standardized MOU for PEG channel delegation that defines the nature and format of content presentation by PEG operators and offers a standardized hand-off procedure for these video feeds to cable and IPTV operators.

In order to make such an MOU effective it will require buy-in and thus input from all relevant stakeholders. As such this MOU could be a starting point to re-initiate negotiations with IPTV providers on the issue. If a common standard can be achieved the potential for infrastructure cost savings through common or shared equipment exist for all operators.

Cost: Staff effort

Recommendations for CATS

The following recommendations for CATS, the CoB's largest PEG provider, cover a range of operational and technical issues and are grouped by subject area where possible. The overarching goals these recommendations aim to support are as follows:

- Improve the completion rate of public access video projects.
- Empower pubic producers to compellingly tell their stories.
- Cultivate an active community of contributors and consumers that is welcoming, supportive and enabling for new and established public content creators alike.
- Provide value for many diverse constituents.
- Provide "higher touch" service without increasing staff level or burden.
- Free staff to focus on content rather than administration.

A guide outlining the interdependences between the various recommendations can be found in the appendix.

Online Training Resources for Contributors

Build up repository of training materials both for external and internal training. The material would be available upon registration only. This will provide a central point of reference and allow for extended self-paced learning and knowledge refresh by *registered* CATS contributors.

This material may be developed gradually and could probably evolve from the proposed internal general reference WIKI. Access to the content would be password protected using the new content managed CATS website (see relevant recommendations for WCMS).

Cost: Free, internal effort only

Reference WIKI

Provide a WIKI based checklist available on the CATS intra-net to define workflow requirements for getting material ready for transmission, such as file naming conventions, encode settings etc. This is intended as an interactive tool to communicate up-to-date processes effectively.

After speaking to the engineering department it appears that human error accounts for most exceptions or mistakes when preparing material for transmission. Errors such as incorrect file naming or pre-roll are common. The potential for mistakes due to operator confusion is even higher now that some material is broadcast via an MPEG2 playout server and other content is played to air off tape, the latter having a pre-roll requirement.

The WIKI format has been chosen as it allow for feedback and issue tracking within the same environment thus adding an additional level of staff engagement. After the completion of relevant OS X server upgrades these pages could be hosted on the built in free WIKI Server (V.2 for OSX 10.6 Server) as part of the existing hardware/software portfolio at no extra cost.

The advantage over for example laminated cards in all edit suits lies in the simple update process that will maintain the relevance and trustworthiness of the information contained in the online checklist. This is a vital component in maintaining user engagement.

Cost: Free, internal effort only

WIKI Homepage

To maintain maximum mindshare the WIKI holding reference checklists and training material should be set as home page on all browsers within the CATS office network domain. The reference (and potentially future training) WIKI should be actively promoted to all CATS staff through this method. Additionally, this high profile exposure to WIKI content every time a new browser window is opened would further

improve the viability of the WIKI as general bullet board for staff announcements.

Once Open Directory has been deployed (see relevant recommendation for further details) this browser configuration feature can be managed centrally for all machines with little effort.

Cost: Free, internal effort only

Lynda.com Training

Provide access to quality video based online training resources for commonly used software applications within CATS. These training resources would serve to develop the skills base within the workforce and could also be used to offer advanced *on-site* training to interested public contributors.

Lynda.com is a provider of such training resources and offers access to many hours of videos tutorials for products such as Final Cut Pro or OSX 10.6 server. The service is subscription based and accounts are usually tied to a specific user. Multi-user / site licenses are available and we strongly suggest that CATS seek to negotiate a site-specific deal.

The recommendation of Lynda.com is based on personal preference for the service, quality and structure of its tutorials by the author of this report. The author is not affiliated with this provider. Other similar services may exist and CATS may assess them as appropriate.

The benefit of this paid service, over free offers such as you-tube tutorials, lies in the quality-controlled content, easy accessibility and clear course like structure of its tutorials.

Cost: $250 - $375 per year per user

Total: $750 per year (approximately)

Server Hardware Swap

Redeploy server hardware based on expected process load. CATS is in the possession of two recent generation Apple Xserve rack mount servers (See appendix for detailed server specifications). Currently the lower spec machine is used for file serving purposes, whereas the higher spec machine acts as QuickTime streaming server for the CATS website (catstv.net). The latter machine is significantly under-utilized whereas projected software upgrades are likely to increase the workload on the file-server unit.

We propose the swapping out and redeployment of these servers. The 4-core machine should be re-assigned for streaming purposes. The 8-core machine, which is newer and faster (currently used for QuickTime streaming), should be redeployed for general internal fileserver duties.

CATS should seek the amendment of its MOU on streaming services with the CoB to formalize redeployment of the covered 8-core Xserve. The City has already agreed informally to this redeployment as it is felt MOU resources should be used as effectively as possible.

Cost: Free, internal effort only

Server Operating System Software Upgrades

To make use of the latest generation WIKI server software as well as easier administration and higher performance (see: http://www.apple.com/server/macosx/performance.html) we suggest to upgrade the operating system of the 8-core Xserve server, re-deployed for internal file serving purposes (see relevant recommendation on hardware swap), to OS X 10.6. This machine will be the likely candidate for hosting Final Cut Server (FCS). Apple confirms compatibility of FCS and OS X 10.6 (see: http://support.apple.com/kb/HT3840).

The 4-core Xserve responsible for QuickTime streaming in the future could also optionally be upgraded to OS X 10.6 Server. The main benefits lie in systems communality for administrative purposes and

improved performance. The latter will become relevant once this unit hosts the new content management-based website for CATS.

Thus the upgrade priority is as follows:

- First: 8-core Xserve
- Second: 4-core Xserve

Cost: $499.00 per machine (excl. taxes) from Apple.com

Total: $998.00

Server RAM Upgrade (8-core Xserve)

The 8-core machine, to be deployed as internal office file server, would benefit from a significant RAM upgrade. (Current system memory is 2GB). Based on the available memory banks and operating system requirements at least 6GB of additional RAM are recommended, bringing total system memory to at least 8GB.

The 4GB of ram available to the 4-core machine seem adequate for the foreseeable future to support web hosting and streaming. Additional memory is not required for this unit.

Cost: $100 per 2GB from Apple.com. NOTE: A compatible 6GB kit from crucial.com would cost approximately $250.

Total: $300 (for more expensive Apple based case)

Open Directory Implementation and Rollout

Implement full Open Directory based access (ODA) to the CATS network to centrally manage user accounts, system configurations and resource scheduling such as camera check out. Use 8-core Xserve as “master”.

CATS currently relies on local authentication and general purpose accounts on specific workstations. In order to improve network and systems security in an increasingly IT centric production environment, a switch to ODA is highly advisable. Furthermore, all advanced workflow measures such as FCS and WIKI-server participation rely on or benefit from centrally administered user accounts. Without ODA audit trails, review workflows, restricted access to user specific projects are not feasible to implement.

We acknowledge that a transition to ODA will represent a fundamental change as to how people perceive the way they connect to the CATS network and interact with its resources. We strongly advise that the reasons for this transition are clearly communicated to help build user support during the transition period.

Additional training for those administering the current systems would be essential to ensure a smooth transition.

Given the number of mission critical elements in the CATS computing infrastructure, pursuing a phased roll out would be advisable.

1. Public contributor accounts for edit workstations. (This would also allow for selective management of Internet access privileges in these suites).
2. General staff accounts with roaming (network based) home directory feature and role specific access profiles to various systems.
3. Migrate managers to centralized authentication and consider switching them to network based home directories to enable remote access capability.

Cost: Internal effort only

@catstv.net Email Domain

Configure the catstv.net domain to receive email. Issue all staff with a catstv.net email address and have them use this address consistently for all external communication. The catstv.net email service could either be hosted by MCPL or may be outsourced to a third-party operator such Google.

If email accounts are hosted through a third party provider CATS should be disciplined about reclaiming the email addresses of former staff and re-assigning to account as needed to control cost.

Cost: $30 per year per user for Google hosted catstv.net (includes access to other Google apps. See: http://www.google.com/apps/intl/en/nonprofit/index.html)

Equipment Booking and Tracking via Open Directory

Implement resource listing and scheduling through Open Directory for camcorders and other "loan" equipment.

Operations at CATS expressed a desire for having a better and more universally accessible system to keep track of which pieces of checked out equipment are due for return on a specific day by a public producer. The current system is paper based and perceived to be effective as is. However, it was felt that generating a return schedule for a specific day was still somewhat time-consuming. There had been attempts to introduce an inventory-tracking database in the past but the system was abandoned due to usage complexities and inconsistencies (thus ultimately failing the user acceptance test).

Given this insight and the fact that the equipment loan operation is small enough (and likely to remain at this size for the foreseeable future) to be effectively managed on paper without creating a bottleneck in the operational workflows, a positive cost/benefit argument cannot be made for investing into hard and software for a new, dedicated, barcode-based inventory-tracking system.

However, once implemented, for the purposes described in the section pertaining to Open Directory, the ODA system will allow for storing resource information (for non-IT resources such as rooms for example) as well as user or computer specific information. Commonly corporations use the resource feature to manage and track meeting-room availability. In the case of CATS, equipment checked out by public producers could be treated as a resource. ODA would then provide the means for readily querying the daily availability of specific camera kits. Given the labor only expense for creating and managing this information with standard desktop applications such as iCal this solution seems effective. Operations have expressed a strong interest in pursuing this option should it become available.

Cost: Internal labor only

Final Cut Server (FCS)

Centralize post production workflow using Apple's Final Cut Server (FCS) software (V1.5 or higher) hosted on 8-core Xserve. Benefits would be realized from centralized management of storage. The administration of a fleet of external drives has become increasingly time-consuming and may occasional represent a resource bottle neck.

Central project management and supervision will enable "higher touch support" for publicly produced projects. This higher touch approach, though making more targeted and personalized support (often preemptively) available, should lead to increased engagement with contributors and raise completion rates of projects above current levels. Production staff mentioned during the research phase for this report that low completion rates are an issue for public projects.

Approval and automated encoding workflows for internal projects should (combined with the Reference WIKI) reduce the number of human errors made when preparing material for telecast as well as help reduce the "turn around time" to bring material to air. Moreover, direct automatic content and metadata integration with a future archiving system will reduce labor overhead, tape consumption and increase archive completeness.

NOTE: There is the potential for a V2.0 release of FCS near IBC2010 (a major tradeshow for the broadcast industry held each September in Amsterdam, The Netherlands) and this should be factored into the purchasing decision. If prerequisites for a FCS deployment have not been met (Xserve hardware swap, ram and OS upgrade) by the end of July it would be advisable to delay purchasing until after IBC to await any announcements by Apple regarding a new version of the product.

NOTE: Hardware requirements necessitate RAM upgrade on hosting Xserve (http://www.apple.com/finalcutserver/specs/).

Cost: $999 from Apple.com. Factor in projected upgrade fee to V2.0 in nearer future (based on historic values upgrade fee estimate: $299).

Total: $1298 (incl. upgrade estimate)

Focus on Training - Advisory

Provide training opportunities for staff and public producers. Develop training plan based on self-audit. CATS operations specifically recommended considering a training program for master controllers to develop FCP skills to be able to assist public producers when other suitable help is not available. The measure above would represent a skills diversification and staff development effort to further improve operational flexibility.

Cost: Variable. (See Lynda.com recommendation).

Web Content Management System (WCMS)

Deploy a new "catstv.net" website, based on the "Drupal" web content management system and host this site on the existing 4-core Xserve.

Content updates to the catstv.net website which do not pertain to the streaming of government meetings are currently mostly handled by library IT staff. Given the anticipated trajectory towards a stronger, more content rich online presence, the volume, frequency and time criticality of website updates are likely to increase sharply. To avoid creating an operational bottle neck based on library IT resources it would be best to enable CATS to directly and actively manage their website. A web content management system will provide easy and flexible template based publishing capabilities to a broad range of CATS' staff (without the need for significant training) while allowing for editorial approval workflows to maintain quality.

The use of WCMS has become best practice across many industries reliant on complex or highly dynamic web-content.

"*Drupal is a free software package that allows an individual or a community of users to easily publish, manage and organize a wide variety of content on a website…*" (http://drupal.org/about)

Drupal was chosen due to its open source nature, large developer community and advanced integration with proposed back-office systems such as the archive preservation system (APS). With its deployment for high profile sites such as whitehouse.gov or alliancecm.org (the new ACM site), Drupal comes with strong enterprise class credentials. It should be noted that both the Library and CoB have indicated that a certain degree of Drupal expertise is available among their staff. (Furthermore, WFHB, a successful community radio station in Bloomington also uses Drupal for its web presence).

The Drupal deployment should provide the following functionality based on a two-stage deployment:

Phase 1

- Rapid publication of web content with integrated approval workflow
- Direct search, browsing and consumption of APS (Archive Preservation System) content, data tracking for related searches and consumption to power recommendation system (See e.g. Amazon's recommendation features)

- Themed publishing templates consistent with CATS on-air identity
- RSS feeds for various content areas

Phase 2

- User accounts for public producers to provide access to private training material and discussion forums
- Upload of externally produced content for approval and telecast
- Content exchange area for ACM members
- RSS feeds to support emergency broadcast information (subject to further investigation) – Subject to new FCC standard.

A professional Drupal site could be deployed in approximately one week assuming only minor customizations of a standard publishing theme/template.

This estimate excludes integration work between Drupal and the APS. However, given that off-the shelf code is available for this purpose this work should not consume undue amounts of developer resources.

Cost: $2500 (estimated) in external labor (note this work could potentially be carried out by MCPL or CoB staff) for phase 1; Phase 2 functionality could largely be realized through internal skill building as site administrators become more familiar with the software and would thus not create additional cost.

Sprinkler Deactivation – Advisory

Meet with MCPL building support to determine actual status of sprinkler system and determine viability of deactivation of the system in sensitive areas such as the tape archive and machine rooms. Carefully execute deactivation as soon as feasible and explore alternatives to maintain compliance with relevant fire code. CATS may consider soliciting bids for a non-water based fire suppression system for its tape archive room at this point.

Cost: Unknown

Archive and Preservation System (APS)

Provide a media rich digital archive and preservation system to store and manage all past and current media output by CATS. The implementation of this project depends on the successful ratification of the CATS metadata definitions (see relevant recommendation).

The one fundamental difference compared to the current archive management system is the embedded storage of digital media assets (and associated documents where applicable) within the APS system. In contrast, the current archive management system only stores metadata, referencing a specific tape on a shelf in the tape room. With a suitably resilient APS implementation such shelved tapes become unnecessary, enabling considerable savings in tape stock and storage space.

While a range of proprietary archive and preservation systems, capable of digitally storing (media) assets, are well established in the market, their cost can often be prohibitive for a publicly funded organization the size of CATS. Furthermore, such systems may impose future constraints in terms of feature expansion or data migration due to vendor lock-in and/or persistence.

Based on these concerns this report recommends a proven open source solution. Based on ease of integration with Drupal the (WCMS) two primary options present themselves:

- DSpace
- Fedora Commons (not to be mistaken for the RedHat Inc Linux distribution “Fedora”)

NOTE: Both projects are now coordinating their cloud computing efforts under the umbrella organization “DuraSpace”.

Based on initial research, integration between Fedora Commons and Drupal is more mature and better documented. However, links to DSpace also exist, fundamentally making both systems viable options. For the purposes of this document we will assume a Fedora Commons based APS.

Object structure:
Objects in the APS would use the CATS Metadata Model (see relevant recommendation in this document).

Example (high level):

- Video asset at archive resolution (see meta data definitions)
- Video asset at web resolution
- Descriptive metadata such as producer name, synopsis etc
- Associated content such as production documents or documents discussed during Government meetings
- Identifiers to clear associated content items for web publication

The combination of files and metadata described above would form one particular "compound digital object" within the APS.

A digital object may also refer to externally stored content items (http://www.fedora-commons.org/confluence/display/FCR30/Fedora+Digital+Object+Model) allowing for a swift migration of the existing archive database to create objects within the APS. As the archive is digitized the external references are replaced with digital video assets stored within the APS.

Implementation overview: Due to the complexity of this project and the varying priority of individual features and specific functionality of the APS a phased implementation is recommended. The aim should be to get the system up and running as soon as possible with its core functionality, described in phase 1a below, available and stable and then extend and expand over time, implementing the remaining project phases sequentially.

Phase 1a – Basic System Setup and Configuration

- Acquisition of server and storage hardware for MCPL site with suitable storage capacity for six months worth of content and room for further expansion (unpopulated drive slots within the relevant storage enclosure)
    - Hardware fundamentals: Dual processor multi core Linux server with redundant system disks and power supplies. Software Raid 6 volume for Fedora Commons content storage
    - e-Sata-JBOD enclosure or similar for Fedora Commons content storage
    - If hardware based raid controllers are used, these controllers should also be fully redundant
    - Given the access characteristics of the APS content store, i-SCSI attached storage arrays may be suitable. Interfaces, network links and controllers should be redundant in this case
- Use CATS Metadata definitions for repository configuration
- Close out of existing archive system and export data
- Import of historic (closed out) archive system data into Fedora

Phase 1b – Drupal Integration

- Integration of search and content handover to Drupal to allow search and browsing of APS content via the catstv.net website with subsequent streaming content delivery where appropriate

Phase 1c – Integration with Existing Scheduling

- Integration with existing schedule management application to enable the application to refer to content items stored in the APS for scheduling purposes.

Phase 2 – FCS Integration

- Integration of automated content exchange with Final Cut Server

Phase 3 – Integration With Future New Scheduling Application

- Integration with new schedule management system in the event that CATS chose to procure such a system.

Cost: $5000 (Server, JBOD enclosure, 6 months of Storage)

Phase 1a: Basic system setup and configuration cost (variable depending on level of internal IT involvement) $0-$4000 estimated

Phase 1b: Drupal integration cost (variable depending on level of internal IT involvement) $0-$2000 estimated

Phase 1c: Integration with existing scheduling application cost (variable depending on level of internal IT involvement) $0-$2000 estimated

Phase 2: FCS integration cost (variable depending on level of internal IT involvement) $0-$2000 estimated

Phase 3: Software integration with future new scheduling application (variable depending on level of internal IT involvement and complexity/openness of new scheduling system) $0-$4000 estimated

Total (range): $5000-$19000

NOTE: Due to the mission critical nature of the system server hardware assumes high level of redundancy. Please refer to section on alternative IT service procurement for suggestions for reducing software integration cost for IT projects.

Use *incremental* procurement of storage to utilize declining per GB cost curve of hard disk storage. Procure hard disks for initial setup through a range of re-sellers to try and spread hard disk fleet across different manufacturing batches for increased batch fault resilience.

Metadata Standards – CATS Metadata Definitions

Establish metadata framework for APS. Please refer to the appendix for a proposed sample framework.

This proposed framework builds on the draft metadata framework by the ACM and expands it with some CATS specific classes to enhance the archive functionality and facilitate metadata import/retention from the old archive management system. Where possible these additional classes are directly drawn from the more extensive PB-Core metadata specification used by PBS.

When considering the metadata framework CATS should evaluate it against the needs of key production and transmission workflows within the station. What additional data describing a content item are/should be created that are useful for archiving and that will help later on enable other workflows or services drawing content from the repository?

After review CATS should seek input from the City regarding CoB specific metadata needs. A corresponding item can be found in the relevant section pertaining to recommendations for the CoB in this report.

It is essential that the metadata framework is finalized ***prior*** to the configuration and deployment of the APS, as it defines central configuration parameters for the APS.

Cost: Staff effort only

UPS Support of Core Systems – Advisory

Check, confirm and test capacity for uninterrupted power supplies to sustain continued operation or orderly shut down of mission critical server hardware.

Specifically:

- APS (hardware to be acquired)
- FCS/Open Directory Server (8-core Xserve) + external storage
- Drupal / QuickTime streaming server (4-core Xserve)
- Transmission and playout systems

Cost: Internal Effort plus necessary upgrades (unknown/TBD)

APS and WCMS Integration

Use "Islandora" plug-in to enable search and browse access for digital assets stored in the APS via CATS based Drupal website.

"Islandora is an open source project underway at the Robertson Library at the University of Prince Edward Island. Islandora combines the Drupal and Fedora software applications to create a robust digital asset management system that can be used for any requirement where collaboration and digital data stewardship, for the short and long term, are critical." (http://islandora.ca/collections)

The integration should allow for permanent links to all content such as recently added government meetings. Furthermore browsing and search of the archive should be available through the catstv.net site.

To simplify the process and increase access speed each Fedora media asset should contain a web-encoded version of the content. Additional, related content stored in the "compound digital object" within the APS such as PDFs of plans discussed during a Planning Commission meeting could also be displayed.

Cost: Accounted for in the APS implementation, Phase 1b ($0-$2000)

APS and FCS Integration

Provide automated archiving and retrieval of completed projects on Final Cut Server to and from the APS. Note this integration step is not essential for the proposed infrastructure to function. Subject to manual project archiving from FCS, these items could be checked into the APS by an operator. After manual retrieval from the APS relevant projects could also be manually re-ingested into FCS. This step seeks to automate the process to reduce the risk of human error.

The project covers two parts that require the creation of custom scripts. Given that content will more frequently move from FCS to the APS a partial implementation of the automated process is possible.

FCS – Export

Script to

- Export metadata file for APS
- Export FCS project folder (FCP project file, media and associated documents)
- Encode web resolution file of final project
- Encode broadcast resolution file of final project
- Move package to suitable watch folder on APS

FCS – Import

Script to

- Process and ingest suitable media packages in watch folder and add to approval queue to clear for use within FCS project

APS – Import
Script to

- Process and ingest suitable media packages in watch folder and add to approval queue

APS – Export
Script to

- Export FCS compliant metadata sheet
- Export FCS project folder (FCP project file, media and associated documents)
- Move package to suitable watch folder on FCS

Cost: Accounted for in the APS implementation, Phase 2 ($0-$2000)

IP Fiber Link Between CoB and CATS

Light dark fiber between MCPL building on East Kirkwood Ave and CoB machine room at city hall to provide high-speed data connectivity. (The City has indicated it would be prepared to make this service available should CATS be interested and able to use it.)

This link may be used to carry data traffic to synchronize the proposed mirrored CATS APS backup as well as carry future IP based video signals from the showers control room. Moreover, access to the FCS could also be provided from the shower control room to provider advanced production services as necessary.

Cost: TBD for initial hardware (subject to further negotiations between CoB and CATS), operating cost $0 for use by CATS

Off-Site Backup for APS

Provide a mirror of the CATS APS server off-site, potentially in the CoB machine room. This would represent a significant improvement in terms of archive protection for the historic video assets currently held in the CATs tape room at the MCPL site. Currently programs generally exist as single tape copies in a room that might be at risk from flooding during heavy precipitation due to backed up storm drains. With content preserved from decaying tapes and increasingly difficult to play tape formats after digitization, additional resilience due to geographic diversification could be achieved relatively inexpensively.

More importantly the status of the sprinkler system within the MCPL building is unclear and both the machine room and the tape room are at risk from water damage due to sprinkler discharge. Upon a site visit it was noted that the machine room is equipped with a Halon fire protection system, however, sprinklers were also visible. CATS engineering confirmed their uncertainty as to whether this part of the sprinkler system was active.

The CoB machine room stands out as a choice for a suitable location, since high-speed data connectivity between the Library and CoB facilities could be established cheaply, quickly and at no cost except for equipment through the use of dark fiber in the Bloomington Digital Underground (BDU).

Cost: Internal labor, server hardware and initial storage $4000 (NOTE: storage capacity to be increase incrementally as digitization progresses).

Total: $4000 start-up cost, operating cost $0

Web Accounts and Forum for Public

Post WCMS implementation enable optional website specific accounts to offer public producers/patrons access to training material and personalized communications. A moderated forum could also be added to facilitate information exchange between like-minded contributors.

Cost: Internal labor only / Admin time

Public Content Uploads / Submission

Provide public producers with the ability to remotely submit content for telecast and streaming. This feature should be subject to the normal approval procedures as applicable to material produced and submitted onsite.

Cost: Internal labor only (Some systems integration charges may apply depending on the level of automation desired for remote content submission)

Emergency Communication Plan - Advisory

Refresh emergency communication plan for CATS as well as backup and data preservation procedures in emergency situations. CATS should ensure that responsibilities and tasks for ensuring operational continuity are clearly assigned and communicated.

Define who is to be contacted/in charge in an emergency. How, where and when is content backed up for recovery and under which circumstances are the relevant emergency protocols active. Standard business continuity procedures should guide this planning.

Cost: N/A

External Storage Expansion for 8-core Xserve

In order to fulfill its roles as central video production repository running Final Cut Server the 8-core Xserve will require an upgrade to its current storage subsystem. This upgrade will need to take into account both storage space requirements (how many TB of data/hrs of footage can be stored) as well as storage agility. Based on current workflows the system may be required to provide low latency concurrent access to approximately 10 video streams at up to 50Mb/s per stream.

The following requirements are relevant to the choice of storage solution:

- Capacity
- Agility
- Resilience

Capacity

The natural server IO capability is limited on the client facing side by the transport capacity of its two 1Gb/s Ethernet network adaptors. In terms of pure system bandwidth the 10-video-stream performance requirement should be easy to meet.

In terms of storage capacity the goal is to provide enough storage space for a fully tapeless production environment covering all storage needs for approximately 2 months worth of work in progress. It should be noted that the proposed system is intended for work in progress *only* and not as a substitute for the proposed APS. The system is intended to be used with regular content archive procedures (purges) of completed projects onto the APS.

Agility

Video editing and playback often rely on highly fragmented data access patterns as different video segments need to be rapidly assembled from different areas of the storage array during playback. The only effective way to address this agility issue is to distribute the access requests across a suitable number of drives and employ a high quality raid controller to smartly handle the request queue.

Furthermore, the lower the latency between the server and the storage subsystem the more favorable over all system performance will be due to the time critical element of video (frame) playback. The latter requirement speaks against IP attached technologies such as iSCSI, which has to content with the additional overhead of the network protocol stack. Low latency interconnects such as Infiniband or Fibre channel increase both controller and cabling cost and may be outside the cost efficiency requirements of this project. Especially since access

complexity is unlikely to require the multi-headed server arrangements of a SAN (storage area network) in the foreseeable future.

In the event that extra financial means become available Fibre Channel seems the preferable option based on entry-level cost and vendor choice for a deployment of CATS's size. In the context of a distributed work environment to support a local news initiative in collaboration with various Bloomington public media outlets as well as the use of BDU resources (see section 4), Fibre Channel provides more operational flexibility. The encapsulation of Fibre Channel over Ethernet Networks is more mature than Infiniband at this point in time.

This leaves the conventional parallel SCSI interface or eSATA and PCI-Express bus extenders as the only other viable interconnect options between the Xserve server and the proposed storage subsystem.

Resilience

Centralizing work in progress on one system does significantly reduce the administrative overhead of managing individual video assets or projects compared to the current model pursued by CATS, which relies on local on-system and firewire-attached storage. It helps improve suite utilization by decoupling production projects from physical suites thus allowing any available edit system to work on any project or enable easy collaboration across suites on one larger project.

However, the drawback in this centralized approach lies in also centralizing the point of failure for project storage. Failure of this centralize repository will impact all projects and all attached suites with potentially disastrous consequences to station productivity.

For these reasons any storage subsystem under consideration must not only meet performance but also the highest reliability requirements. Any subsystem under consideration should be capable of RAID6 data protection allowing for the failure of 2 disks in the array while maintaining data integrity. The second disk reserve eliminates the risk of data corruption during a rebuild (after a drive failure) should for example the wrong disk be replaced by accident. Additionally, capabilities for hot swapping of drives, a hot-spare drive and automatic event notification are desirable. Dual (redundant) power supplies are a mandatory requirement, given the high availability environment the system will be deployed in. Dual redundant raid controllers or easy exchange of a single controller board are highly desirable.

Cost: From $3000 per Enclosure (e.g.: Promise VTrak M310P - this is an example of a configuration based on the SCSI interface, Fibre Channel may double the enclosure cost depending on type and manufacturer)

$300 Server Sided Controller Card and Cables

$100 per 1.5T SATA drive – 12 drives

Total: $4500

Security Audit – Advisory

As CATS moves to an ever more IT centric production infrastructure, availability of systems and network become of increasing concern to ensure uninterrupted program production and delivery. It was noted during conversations with staff that there is a certain degree of awareness of this issue but also a sense of apathy with regards to action. This apathy seems to stem from anxiety to confront this seemingly complex issue as well as the notion that a security breach is ultimately inevitable. While there is most certainly no such thing as perfect security the author of this report strongly feels that this issue warrants more attention and action in the future.

One major concern voiced pertains to the seemingly complex and time-consuming way of administering the security settings on an ever growing fleet of workstations. It is thus strongly recommended that the rollout of Open Directory should be used to unify configuration and rights management for both machines and users. With public producer accounts being most restricted and mandatory virus scans for removable media (such as USB sticks) being introduced at the very least.

The library IT department should be consulted to help optimize on site security policies and potentially help with virus protection licensing and software selection. While most of the infrastructure at CATS is OS X based, this should not be a reason to further avoid this issue as threats to this operating system are likely to grow with its continuing gain in market share. This author would suggest considering a security product that is specifically geared towards the Apple platform such as Intego Virus Barrier or similar.

In the interest of continued service it is suggested that the CoB may also consider offering help and advice on IT security matters to CATS.

NOTE: While out of scope for the purposes of this project, it was noticed that the physical access control system at CATS is no longer operational. The system was based on keypad locks, which are no longer supported by the vendor. Any updates to such a system might be best considered in conjunction with any staff/pass ID card measures carried out by the Library facility.

Cost: Staff effort plus potential virus protection licensing cost. Up to $750p/a for the site if no bulk licensing agreement can be reached.

Production Related Metadata Capture

Production related meta-data and documents should be captured in electronic form for easier access and archiving and value added features during content delivery. The most salient example for this recommendation is the “program proposal” required to be submitted by public producers to gain access to the CATS production resources. This document is currently submitted on paper/hard copy.

While CATS staff stated that public producers are generally not bound by their initial proposal, an electronic version of the proposal filed with the editing project on FCS could be more easily kept up to date as the scope/nature of the project changes. This electronic version would allow for easy adaptation to provide the synopsis metadata for archiving (and search) as well as delivery to listing services and thus ultimately EPG display.

For this approach to be effective slight adaptations to the current program production workflow at CATS would be required. Please refer to the sample workflow description further blow.

Cost: internal effort / workflow change only

Archive Encoding Standard

Standardize on one encoding standard/file format for all content masters (finished programs ready for telecast) stored in the APS. The main issues to consider when making this decision are as follows:

Assumptions

Content checked into the APS for long term archiving is generally final. This means a project has been completed and further editing is unlikely to occur. The product is suitable for telecast as is. Rushes/ISO tapes not used in the main program will generally not be archived unless in exceptional circumstances where these tapes document valuable historic events. If programs are cut with alternative endings for example, multiple versions may be stored. APS content is generally new, that means genealogical relationships between various program masters are unlikely. This means programs are usually not made from other programs already stored in the archive but comprise new content specifically produced for the program. Once archived, the stored material will generally not be subjected to future extensive video effects, chroma keying or color grading work.

The above assumptions allow for high quality yet efficiently compressed video encoding on final content masters. It should be noted further that in many circumstances, especially in the case of older material, the content master might have been stored on analogue tape. Such an analogue recording process in it self would have degraded the quality of the source material more than any [virtually transparent] compression process could do.

All statements made within this recommendation are based on the current standard definition video content base but may also be transferred with suitable adaptations to any future high definition

content that may be stored at its source resolution and frame rate in the APS.

Long-term Viability/Licensing Issues

Unlike with hardware procurement problems for obsolete tape formats, software playback of video files is unlikely to ever represent a significant problem in the future for as long as the intellectual property rights to the file format and compression codec have not been compromised. For these reasons standards based codecs such as Mpeg 4 (part 2 or 10 [AVC]) or open source codecs with established patent security are preferable over proprietary solutions tied to the "fortunes" of a specific vendor.

Licensing cost for Mpeg formats usually becomes only relevant at the point of distribution (such as in the case of Mpeg4 part 10, see http://www.mpegla.com/main/programs/AVC/Documents/AVC_TermsSummary.pdf) and thus represents little cost concern from the internal use/archiving perspective.

Quality

While there is inherently a desire to preserve material at the highest quality possible, such goals may have been already subverted by historic compromise, based on analogue tape recording further up in the production chain (as indicated above). Given that material is generally final and will only be retrieved to either be telecast or serve as a source for a derivative/transcoded version for delivery on a different/new platform such as Internet or mobile streaming, the material needs to be of *sufficient* quality to support these needs reliably. Such transcoding processes will inevitably introduce some quality degradation, akin to generation loss on analogue recordings. Thus master content stored in the APS should be of sufficiently high encoding quality to withstand potentially two careful transcoding steps and be still acceptable for telecast.

These requirements can be met sufficiently by carefully compressed group of pictures (GOP) based Mpeg4/AVC encoded material without the need to retain uncompressed material.

File Size

Some file size reduction compared to DV25Mb/s is desirable, with a targeted reduction of approximately 50% in file size. Incremental storage extensions to the APS are recommended to leverage decreasing hard disk cost as the APS storage volume grows over time.

Encoding Complexity

High quality encoding, particularly for AVC content, can be time consuming. CATS is in the fortunate position to own a number of licenses for Apple Compressor through Final Cut Studio and the Qmaster distributed compression tool. This will allow CATS to use its Apple workstation fleet for compression tasks during periods of low system utilization, considerably increasing the station's encoding capacity.

NOTE: Apple's switch to 2.2 system gamma may cause issues when exporting content from Final Cut Pro. A starting point for support issues can be found here: http://support.apple.com/kb/HT3712 and here: http://support.apple.com/kb/HT2912?viewlocale=en_US. An unofficial discussion of the behavior can be found here for example: http://forums.creativecow.net/thread/8/1027614

Transcoding Suitability/Compatibility (ACM mpeg2)

Any archive format chosen should be capable of producing (transcoding to) broadcast quality Mpeg2 files according to the encoding requirements specified by the ACM for content interchange between PEG stations.

(See section 1.1.1 through 1.1.15 of the ACM video-file and metadata standard http://www.alliancecm.org/standards)

Audio

Until multi channel audio becomes part of the production and delivery capabilities of CATS all audio should be embedded into the video files as uncompressed 16bit PCM audio (preferably at 48kHz sampling frequency) to facilitate the best possible sound reproduction. This will be of particular benefit for concert recordings such as during the Lotus Festival.

NOTE: AVC encoded files support compression for audio based on various codec settings and CATS may chose to drop the PCM audio requirement if acceptable settings are specified based on internal testing.

Recommendation

Archive encoding quality target: AVC/Mpeg 4 part 10, HiP, Level 3, 720x480@29.97/30fps, 10Mb/s; Audio PCM stereo: 44.1 or 48kHz sampling or better, 16bit or better subject container file format support and source material (avoid sample rate conversion or up/down sampling of bit-depth), ~1.5Mb/s or higher; QuickTime Gamma issue: Check and adjust for correct gamma as necessary based on system settings.

Cost: n/a rely on already licensed distributed encoding technology available through Apple Compressor and Qmaster.

Update Contracts to Include Web Distribution – Advisory

Where possible, the rights release section of contributor contracts should be updated to include content distribution rights for other current and future platforms such as Internet and mobile delivery. In some instances contributors may be reluctant or unwilling to grant these rights. In some instances streaming instead of download rights may be acceptable. In other instances time based embargos may be suitable for various platforms, such as for example delaying online deliver by a certain period of time. The most complete rights package and appropriate “fall back” positions should be included in the negotiation process for all future contracts. This section does not constitute legal advice.

Action Point: Update form contracts for contributors (in consultation with MCPL legal council) to reflect rights for new distribution methods.

Cost: Internal legal effort

Track Rights Attached to CATS Content in APS

Specific attention should be given to rights related metadata capture as part of the CATS production and archiving process. The metadata schema implemented in the APS configuration should reflect this fact to maintain active awareness of the rights status of any content in the repository.

The following list contains points of major importance on this matter but is not exhaustive. Additional data may be added as deemed appropriate by CATS.

- Contributor name and age
- Type of work: Work for hire, donation, derivative
- Primary rights holder: (CATS if work for hire)
- Date of first publication
- Date of creation
- Type of license for donated work: Perpetual, transferable, limited, expiration, etc.
- Platforms covered
- Platforms specifically excluded
- Platform specific restrictions: Type of deliver (streaming, progressive download, download), embargo periods, repeat clauses
- Rights schema to accompany exported content for exchange with other PEG channels. (License granted by CATS) – Consistency check against license type and holder may be required.

For historic content some of these fields may remain undefined and CATS may chose to implement specific policy decisions with regards

to the use and/or promotion of undefined content specifically for their online services. This section does not constitute legal advice.

Cost: APS implementation effort

WCMS Request Feature for "Telecast Only" Content

Extend program request process to integrate with online search function. For content that CATS has been explicitly barred from distributing online but holds telecast rights to, the search function on the WCMS based Drupal site querying the APS should return content information without a link to the material. In this instance the option should be provided for a registered user to request this program for on-air play in return for providing her email address.

This address may then be used by CATS to provide the user with a notification of the scheduled transmission time and date for the requested program and instructions on how to configure their Comcast DVR to record the program (subject to CATS attaining access to the Gemstar/Rovi listing service). If feasible a second reminder email on the day of transmission should be sent to the user.

The feature should only be used for programs unavailable for online viewing to keep the request load and administration complexity for CATS at a reasonable level. In this instance, the implementation could be a simple as a basic submission form on the WCMS with a manual background process to handle scheduling and notification.

If desired, this process could however be automated in conjunction with any updates / changes to the traffic management / scheduling software employed by CATS.

Cost: Internal effort only for basic "manual" implementation

FCS-Scripts Part 2 – Automated Content Push to Playout

Automatically encode, name, and FTP content cleared for transmission stored on the FCS to the file based playout servers. Notify relevant staff of completion or failures. This functionality can be easily implemented using the FCS onboard automation functions and should thus not create additional cost for CATS.

If so desired different export profiles could be set up, based on the channel the material is intended for, until full file based playout for all channels is available. In the case of a tape-based channel, material could be combined with pre-roll countdown and moved to a export workstation as needed.

Cost: Internal effort for FCS configuration only

Transcode Old RealPlayer-Based Meeting Archive

RealPlayer has become largely irrelevant as a media delivery platform in recent years. It has been displaced by Flash-video often based on H.264 encoded content.

CATS currently has a significant number of government meetings encoded for "RealVideo". These videos are served through a largely unsupported "RealMedia" server, which once it fails may render this content inaccessible through the web.

This content covers government meetings during the time period from Jan 24th 2006 until Aug 17th 2009. A suitably equipped workstation with RealPlayer and transcoding software like Handbrake (handbrake.fr) would be able to batch transcode these meetings into H.264 for HTML5, Flash or QuickTime streaming compatibility.

Some questions regarding the associated metadata contained in the links on the current CATS archive page remain. At the time of writing this report the author was unable to ascertain whether the information contained in the link is also encoded into the file name of the source media on the server. Failing this some scripted renaming of transcoded

files using Apple Automator scripts may be required. For examples see: (http://stream.catstv.net/cats/archived.html)

Cost: Internal effort only – suitable batch transcoding software available for free.

Traffic / Scheduling Improvements

Adapt the program scheduling process to the new infrastructure centered on the APS as main content repository.

This project contains two phases:

Phase 1

Adapt and extend current internal scheduling software to work with new APS for content scheduling and automated media and metadata export.

After all data from the current legacy content database has been migrated to the APS the scheduling application should be updated to use the APS database for its source data. Additionally, upon completion of a schedule the system should be able to export a suitable playlist file, subject to digital availability of scheduled assets, for any server based playout hardware in use by CATS.

The system should also be able to export the video assets contained in the schedule if these assets are available in the APS. Schedule assets that have not been digitized yet and are thus not available from the APS should be flagged as tape based with the relevant tape location information provided on a separate list. This list should be used for ingest to the APS to fill missing asset gaps. After all assets have been ingested the playlist should be cleared for transmission and exported.

The scheduling system should also be able to initiate a batch transcoding process through the Apple Qmaster/Compressor network to create files suitable for the respective playout servers (if assets cannot be played back in their native form by the servers). The final output location for files transcoded through these Qmaster jobs should be located in the appropriate location on the playout server's directory structure referred to by the playlist/schedule file generated by the system.

For tape only channels suitable aggregated CMX3600 EDLs or similar for use in FCP should be generated and assets referenced in this EDL should be exported to a suitable project location on the FCS. These EDLs should generate numbered tapes of concatenated content used for playout.

Missing assets not contained in the APS should be flagged for ingest in the same way as for the server process. Once all assets used in a playlist are available in digital form the playlist should be cleared for transmission and exported to the Leightronix playout automation. Tape numbers referred to in this tape based automation playlist should reflect the tape numbers assigned to the aggregated tapes described by the EDLs for their respective projects on the FCS. These EDLs should be conformed with FCP and "printed to tape" for playout.

Given the intermediate step of exporting content from the APS to the FCS and then onto tape for playout by the old Leightronics system, there is some risk of confusions between the aggregate tapes created by FCP and those referenced in the automation playlist. Thus this semi-manual process should only be in place until all channels use server base playout. Ideally such playout should be implemented as soon as financially viable.

Thus this EDL generation feature for assembling playout tapes may be considered optional or in deed unnecessary if the migration to a "server only" playout infrastructure is completed in a timely fashion.

NOTE: The proposed process deliberately forces all content through the APS regardless of the final channel destination. This is to automatically facilitate back catalogue ingest as part of day-to-day operations. After the database migration the APS will contain a significant number of catalogue entries without media files actually stored in the APS. These items are considered incomplete until metadata and content are stored as one compound asset unit on the APS.

Workflows should be adjusted accordingly to allow for the extra time the ingest/encode for the APS will consume. It is estimated that at least one extra day of lead-time should be added.

This approach relies on basic playlists being executed on the relevant server systems and may be sufficient for CATS purposes.

Phase 2 (optional)
Implement new fully featured professional scheduling package including expanded metadata and reporting functionality with *matching* playout server automation to centralize server management and control.

This process would more closely resemble the working practices of network TV stations. The APS would still be the sole source of content under this implementation, thus any records of media assets that have no content stored in the APS will need to have this content encoded and ingested prior to transmission.

Traffic/Scheduling software and server playout automation software of this caliber are generally rather expensive and often incur expensive ongoing maintenance/subscription charges on an annual basis. Moreover, this project would require systems integration work by the software vendor to use the APS database as the main asset source for the scheduling software as well as trigger relevant export and transcoding scripts. Some of which may be repurposed from the phase 1 implementation.

The benefit of such an implementation would lie in the more automated rule based assistance in the scheduling process and the centralized control of all playout server hardware. However, until lower cost options become available phase 2 may not pass a cost benefit test unless CATS switched to largely unattended fully automatic master control operation to offset software cost against an (operator) headcount reduction.

NOTE: After a meeting with the president of Leightronix at NAB2010 (an industry tradeshow) another potential third option has become viable. Leightronix have indicated a willingness to work with CATS to import an asset list from the APS into their "WinLGX" scheduling software controlling their UltraNexus servers (one of which is currently owned by CATS). This could provide some enhanced scheduling functionality at a relatively low cost (exact amount currently unknown) should CATS be willing to standardize on Leightronix products and should the vendor be willing to follow through on the WinLGX asset import implementation. This assessment is contingent on CATS deciding that the feature set offered by WinLGX meets its needs adequately or better compared to the alternatives recommended in this report.

Cost:

Phase 1: $10,000 estimated with detailed development work and testing. This cost could be reduced if only one single export and playlist process had to be maintained rather than either tape based and UltraNexus based playout or server and UltraNexus based hybrid solutions. Any solution incorporating tape based playout would most likely represent the most complex, expensive and potentially operator error prone approach.

Phase 2: >$60,000 for 4 server based channels (likely)

EPG Data Feeds – PVR Restrictions

Provide accurate electronic program guide (EPG) data for Comcast and Tivo subscribers for each PEG channel. This program listing information should enable easy scheduling of Tivo recordings and allow DVR enabled Comcast set top boxes (STB) to record programs carried on any peg channel. Against the backdrop of increasing DVR market penetration and the related decreasing use of real-time viewing it seems vital to provide this feature to keep the DVR consumers engaged in CATS content. If implemented correctly with episode and series information this feature would also allow interested subscribers to follow a specific series of government meetings.

For example: While watching a specific meeting of the Planning Commission the consumer might then instruct the DVR through one

single transaction to record all future Planning Commission meetings, in the same way a consumer might have their DVR record all episodes of their favorite home improvement show.

A correctly populated EPG should also help elevate the brand perception of the PEG channels allowing them to compete for audience attention on the same level neighboring channels, rather than simply confronting the consumer with the rather unhelpful generic description of "local programming".

EPG data will become even more important in the future as STB user interfaces move away from the classic numbered channel grids as their primary entry point for channel selection. More advanced STB interface designs present content in a menu structure sorted by classification (e.g. entertainment, news, sports, etc) and sub-classifications (e.g. comedy, drama, action, sci-fi, etc) as the primary entry point for channel selection with channel based views used as a secondary decision tool by consumers. Thus having comprehensive EPG data available allows the PEG provider a higher degree of control over where and how their programs are listed based on the algorithms grouping the content for the STB menus. Lack of such EPG data may relegate PEG to obscure locations within the menu tree.

The above goals can be achieved by providing program information such as for example time, date of broadcast, duration, title, episode and synopsis to the listing services used by Tivo and Comcast. CATS would provide this data with some lead-time (commonly one week) to the listing service providers for injection into their databases. From this point forward the information automatically propagates to the DVR devices and STB EPGs.

Comcast uses Gemstar/Rovi, whereas Tivo relies on Tribune Media. For completeness it should be mentioned that a third major listing service FYI Television is also active in the US market. The latter caters predominantly to print media. WTIU for example supplies their listing data to all three services.

From initial observation Tribune Media seems the most approachable of all listing services. After discussions with Rovi Corp there seem to be no reservations regarding self-service channel listing information updates by CATS. However, this capability needs to be requested by Comcast on behalf of CATS. The charge for this service to Comcast per channel per headend/service ID ranges from $65-$98 per month.

At the time of writing this report Comcast has outright refused to request this service on behalf of CATS citing that it was company policy not to support any EPG data for PEG channels across any of their franchise areas. CATS might wish to consider a multipronged approach using consumer driven petitions, political avenues as well as co-coordinated efforts through the ACM reverse this policy decision by Comcast.

NOTE: WTIU's submissions to Rovi are covered through their PBS relationship.

CATS is willing and keen to provide the listing data to these services.

To somewhat automate the generation of the listing data and thus keep the staff effort at a reasonable level while maintaining a high degree of information detail and accuracy this process must be supported by any future metadata frame work. So that episodic information as well as synoptic or duration related metadata can be automatically extracted during the scheduling process from the APS. The goal of this process must be to eliminate rekeying of data wherever possible.

Cost: $65-$98 per channel per headend/service id to Comcast per month – might end up being partially charged back. Some systems integration cost may be applicable for automating future metadata extraction and formatting processes.

Total: $4704 (worst case) for four channels per year. Data for channel 96 is already updated through SCOLA TV.

Qmaster Encoding Cluster – Advisory

Apple's Qmaster managed distributed compression technology using Apple Compressor should be deployed on all network connected Apple workstations owned by CATS. If necessary this deployment should be supported by relevant Open Directory policies. A Qmaster enabled machine pool should be used for all compression jobs triggered either by FCS or APC ingest processes.

During times of heavy work load machines should be kept powered on 24/7 to accelerate batch-encoding processes. Particularly encoding for the high quality AVC based (archive) video standard proposed in this document, for use in storage of all master assets in the APS, can be very time consuming. To maintain an acceptable ingest speed distributed encoding/compression of material will be essential.

CATS already owns all required software as part of its Final Cut Studio licenses and should configure its hardware accordingly to leverage idle computing cycles in the Apple workstation fleet.

Cost: N/A – software already owned, internal effort only for configuration and setup.

File Based Playout for All Locally Programmed Channels

Switch all four locally programmed PEG channels (3, 7, 12, 14) to file-based/server-based playout and develop capability for local content insertion for channel 96 based on an open and reliable playout server architecture.

CATS has currently switched two channels to a file based playout system based around the Leightronix UltraNexus server. This type of unit is popular in the PEG community and offers some useful functionality such as still-store features with over lay capability for on air announcements and pass through of external sources. The latter feature would lend itself for local content insertion on channel 96.

However, significant problems exist with the unit in term of meeting CATS long-term objectives. The unit currently lacks any external playlist import capability and has thus effectively broken the link between the in-house scheduling application and server-based channels. Currently playlists are manually rebuilt after relevant content has been imported onto the server. This increases the risk of operator error and is time-consuming, adversely affecting operational scalability of the system.

It should be noted that Leightronix had been prepared to open up their playlist format in the past to facilitate exports from the scheduling application to their tape based automation controllers, so this issue might be overcome.

Unfortunately the current unit only offers composite output with no favorable upgrade offer to SDI out put available. Furthermore this platform is only capable of SD (standard definition playout) with no clear HD upgrade path or road map provided by the supplier at the time of writing this report.

This report thus recommends the repurposing of the UltraNexus system for local content insertion purposes on Channel 96 in the mid term.

Once APS and FCP as well as an updated integrated scheduling application are available, CATS should consider upgrading its operation to a more open system with SD/HD-SDI (serial digital interface) output capability.

Digital outputs will be required to interface with encoding and multiplexing hardware required for delivering digital bit-streams in standard and high definition resolutions to future delivery platforms at the highest possible quality. This option will become particularly important should CATS decide to pursue native inclusion on digital cable tiers (potentially inevitable after full digital cable migration) or (low-power) digital broadcasting.

Any server platform chosen should be able to import playlists based on standard open file-formats which were not created by its built in playlist generation software. The playout server should be able to open such playlists while on air running off another playlist or update its current

playlist with the imported events without interrupting live on-air playback.

Based on the proposed implementation schedule such decisions will be come relevant in 12-18months. While market conditions are difficult to predict, a reasonable per channel cost, based on current vendor offerings, between $5000-$7000 per channel max seems plausible.

NOTE: While most network television playout would be designed with spare playout server ports available in case of equipment failure, the existence of the UltraNexus with its manual playback/scheduling option as fall-back as well as the lack of high-stakes advertising revenue might favor (for economic reasons) an emergency still store with a service interruption apology slide over extensive resource over-capacity in the playout server domain for resilience purposes.

NOTE: Given the potential complexities associated with sustaining automated scheduling for server-based playout through UltraNexus as well as tape based playout (depending on the channel served under the current setup) a phased upgrade might be viable. With the two currently tape based channels being migrated to new playout servers first follow by the repurposing of the UltraNexus and an introduction of the new server hardware to these two channels at a later date.

NOTE: See note on Leightronix WinLGX software in the section on "Traffic/Scheduling Improvements" further above, as to why additional Leightronix hardware may be suitable under certain circumstances.

NOTE: Vendors using generic PCs or Apple computers in combination with video playout cards from Matrox or BlackMagic Design are maturing and their offerings are increasingly able to compete with packaged solutions by traditional broadcast server vendors. After surveying the market at

NAB2010 two products in particular would warrant further evaluation by CATS engineering in preference over other similar solutions (based on cost and performance considerations):

- "just:play" – www.toolsonair.com – Apple / Mac OS X based
- "Cinegy Air Express" – www.cinegy.com – Windows based

NOTE: Some server ports should provide bi-directional capability to support direct recording of material as a substitute for tape based back-up recordings of live events like government meetings.

Cost: $5000-$7000 per channel

Total: $20,000-$28,000

iChat – Internal Use – Internal Server – Advisory

Upon upgrading the Xserve servers implement an internal iChat server to facilitate remote assistance and real-time collaboration through chat rooms. This suggestion is included in this document to highlight this option based on the internal hardware and software infrastructure available to CATS. The iChat setup could be tied in with future centralized account management through Open Directory. The video conferencing and content sharing features might be useful for quick ad hoc virtual meetings. The same might be relevant to providing quick, informal, assistance to public producers working on programs in the edit suites. The iChat setup could be setup for internal use only to avoid staff time being consumed by public producers off site not currently working on a project, thus emphasizing the support role rather than social function of this feature.

Cost: none – configuration effort only

HD Camcorder Upgrades

Any further camcorder upgrades/replacements should consist of solid state based units. At this point tape technology can be considered as out-dated and operationally inefficient. CATS's workflow will soon be ready for completely tape free operation from production, via transmission, to archive.

Inevitably the current DV-tape based part of the public producer-facing camcorder pool as well as units used for staff productions will wear out and need replacing. At this point the transition can be made incrementally.

NOTE: This transition will require a change in workflow and training for public producers and staff. Any footage shot during a production (day/weekend) must be immediately ingested into the relevant patron project account on the FCS upon return of the unit. Public producers must be made aware that failure to do so will result in their footage being deleted upon the routine formatting during the equipment check-in/return process.

Most solid-state camcorders are geared towards HD production. Where possible, 720p at 30fps based on AVC compression at a min of 20Mb/s should be used as the standard acquisition format while CATS remains an SD channel. This resolution combined with the highest possible bitrate during recording the content should guarantee future proof HD content that can be easily scaled to SD resolution. However, additional training for public producers regarding safe-areas will be required, given the 16:9 HD vs 4:3 SD aspect ratios.

At the time of writing this report a suitable example for a replacement unit is/was the Panasonic AG-HMC40.

Cost: $2,295 list per unit. Total below assumes 3 replacement units.

Total: $6,885

Implementation Process / Project Delivery Training

At least two suitable members of CATS staff should be provided with project and IT contract management training to help improve future outcomes of externally staffed IT implementation projects. Such courses are readily available from a range of training providers.

A high level survey conducted by the author of this report indicates that the prices commonly range from $1500-$2500 per person. Yet this report's author does not feel qualified to authoritatively recommend a specific provider. When establishing the price range predominantly course focusing on IT project management were surveyed.

Augmented by self-study online training such courses would represent a good staff development opportunity with both motivational and capability benefits. In the future CATS may have to rely more on external IT specialists to tackle some of the more complex integrations issues (in some instances these contractors may be located in other part of the US or world due to local skill shortages in the area) of its infrastructure. Thus a project management skill base to ensure optimal and timely outcomes would significantly improve the value of future investments and hopefully improve accuracy and speed of project delivery.

Such skills may also be of value when keeping students engaged through partnerships with the School of Informatics to augment the development process.

Cost: Approximately $1500-$2500 per person per course

Total: up to $5000

Alternative IT Service / Coding Procurement – Advisory

Labor for computer programming/coding for website development or more complex IT projects has virtually become an internationally traded commodity. A range of online market places exists that bring together programmers and clients with specific project. The more reputable sites allow or encourage milestone based funding, hold funds in escrow and show publicly available feedback by past clients. Projects may also be procured on a fixed price basis on most of these sites.

These intermediaries make outsourced IT development a lot more affordable and accessible to smaller organizations like CATS.

Given that programming staff is unlikely to work on site in most instances even for conventionally sourced projects, the geographic

separation between programmer and client does not add an extra or unusual complication compared to conventional procurement methods. CATS should liaise with the MCPL IT department in case remote access to any of CATS's systems is required for project delivery to ensure security protocols are followed appropriately.

Below a non-authoritative list of sample providers:

- http://www.getafreelancer.com/
- http://www.elance.com/
- http://www.rentacoder.com/
- http://www.project4hire.com/
- http://pick.im

NOTE: It is useful to browse the current open bid section of such sites for comparable projects to get a more accurate estimate of what may constitute a reasonable offer/bid for the particular project under consideration for outsourcing.

Cost: N/A – contract dependent

Staggered Funding / Milestone Based Funding – Advisory

To continue to improve the timeliness and speed of delivery for IT integration projects it seems advisable that CATS and in turn CoB, in the context of exceptional or grant based project funding, switch to a milestone-based/staggered funding approach. This approach should apply to both the disbursement of funds by the City to CATS for such key projects and in turn also to the disbursement of funds by CATS to its IT contractors/programmers.

This approach should take into consideration both the actual deliverable work-product as well as the time frame for delivery and may incorporate contract penalties at the point of the CATS to contractor relationship.

This approach would bring CATS in line with modern industry practice and would allow for more effective project delivery by all three entities involved. Until CATS has built its own in-house IT project management capabilities (through the training programs suggested elsewhere in this document) it would be advisable for the CoB to provide assistance in project planning, mile stone creation and timeline creation to CATS as part of any engagement involving exceptional/grant based funding. The pooling of CoB and CATS expertise in this way should deliver improved results and also provide a valuable opportunity for skills transfer from CoB to CATS thus further creating long term value in this partnership.

Cost: N/A – extra CoB planning effort for project/milestones

Service Requests for Government Meetings – Advisory

Clearly negotiate the number of meetings to be recorded for government bodies as part of the MOU negotiations. Agree a system of prioritization with all funding partners for the event that the demand for resources (meetings to be recorded) outstrips the agreed production capacity available through CATS.

Cost: N/A

Final Cut Pro Configuration / New Public Producer Training Process

Standardize on Apple Final Cut Pro for public producer editing process to realize full benefits of FCS deployment and improve availability of producer support.

Currently public producer editing needs are partly fulfilled by Apple iMovie and Final Cut Express. While novices may accomplish basic editing tasks on iMovie rather quickly, general staff sentiment is that

public producers quickly run into the limitations of the product at which point support issues become complex and time-consuming.

Furthermore a number of public producers have successfully transitioned onto Final Cut Express, which shares the same interface characteristics with Final Cut Pro. iMovie support knowledge is limited among staff, resulting in producers "getting stuck" on projects when no qualified support is available. Final Cut on the other hand has a much wider support based at CATS due to a larger number of staff being conversant with its use.

Production and operational managers agreed during the site visits that Final Cut has initially a steeper learning curve for public producers; yet staff was confident that this aspect could easily be overcome by appropriate training allowing for better support and progress later in the project lifecycle.

In line with the general goal of increasing the CATS brand value within the community and developing brand associations with quality content production and training, the switch to a professional editing package such as Final Cut, vs. the use of the consumer product iMovie, for public producer editing, will help support and project these values, creating intangible image benefits beyond the pure operational advantages.

iMovie is also incompatible with the FCS based workflows that will form the core of CATS's future production architecture. FCS requires the latest version of FCP to support full integration thus potentially some additional FCP licenses may be required. Final Cut Express is based on an older version of the FCP software and thus does not support full integration. However, these existing licenses could be redeployed for basic ingest processes such as for archive digitization work.

Lastly, to keep the public producer learning curve at an acceptable level, FCP should be configured with only the essential tool bars and well defined user settings in conjunction with FCS. These standard configuration files should be deployed across all patron edit suites.

NOTE: Training procedures and materials currently used for FC Express training are suitable for re-purposing to support FCP training.

Cost: $299-$999 per seat. FCP is part of Final Cut Studio and only sold as part of this bundle. The lower price listed reflects upgrade pricing based on ownership of licenses for older versions of the software.

Total: $1600 assuming a mix of upgrades and new license acquisitions

Software License Audit

CATS should conduct a full software audit of all operationally relevant software owned. This should include licenses for no longer installed products since these licenses may in many instances qualify CATS for upgrade pricing on new replacement products. Track upgrade use of such out-dated licenses to maintain legal compliance with licensing requirements. The final approving party should check upgrade options as part of any procurement decision. In line with the philosophy of centralized information access proposed throughout this document a shared spreadsheet may effectively and inexpensively provide the license tracking functionality.

Cost: Internal staff effort

Schematic Drawings and Drawing Package

Create schematic 2D CAD drawings for engineering purposes of control rooms and other critical facility areas. The CATS operations department mentioned during a site visit that such drawings are currently not available for areas such as the Showers control room but would be beneficial for general engineering maintenance and trouble shooting. Both CATS and the City could benefit from this information being readily available in the event of a technical fault in the area. Furthermore, on-site schematics reflect industry best practice.

Such drawings should be available in plotted form in the respective areas and as PDF documents on the central training/resource wiki for easy access.

To save licensing cost DoubleCAD XT as a powerful yet free 2D drafting package could help meet this need.
(http://www.doublecad.com/)

Cost: Free (DoubleCAD XT) plus staff effort to generate drawings

Contributors' Accountability and Project Completion

Monitor project progress of public producers and facilitate higher completion rates by providing pre-emptive support through centralized progress tracking on FCS. Incorporate a higher touch approach combined with better access to training resources to help those public producers needing mentoring overcome knowledge gaps or inertia and complete their projects.

During site visits lack of project completion by public producers was cited as a potential area in need of improvement. The new centralized production platform based around FCS will allow for un-obtrusive and fast progress monitoring and automated alerts if projects have been dormant for a period of time, prompting staff follow up with public producers. Projects will be clearly linked to a specific producer's project account.

Theoretically a similar support structure could already be put in place now but would require very time-consuming tracking of progress by scanning the external USB drives currently used for project storage. Moreover, currently projects are not readily identifiable by public producer without paper-based tracking. All of which makes such improved support un-economical.

However, it should be noted that from a privacy perspective the capability to oversee a public producer's project already exists and thus centralized progress monitoring does not constitute a change in the overall working environment. Project monitoring is aimed at facilitating progress and makes no claims to exercising editorial control, in line with the public access framework. The goal is to use technology to support the training and mentoring appropriate to help meet each specific public producer's needs in an economically and operationally effective way.

Cost: Staff effort

PEG Content Exchange

Provide an access protected (private) area on the new Drupal based CATS website for the sharing and exchange of broadcast quality PEG content with other PEG providers and municipalities. Unlike the consumer based web streaming and APS search capability this service is aimed at "professional partners" from the ACM (Association for Community Media) community, IACT (Indiana Association of Cities and Towns) and other interested parties.

This feature of the CATS web presence is initially focused on the local Indiana market but should not deliberately exclude potential out-of-state partners. Similar efforts are underway in other sections/chapters of the ACM but are often closely tied to commercial vendors, these projects should be considered complementary and sources of information to further enhance features and usability of the PEG Content Exchange operated by CATS. In line with best practice program file formats and metadata should be based on the ACM guidelines but the system should have enough inherent flexibility to support transcoding into other formats should this be essential for keeping specific partners engaged.

The goal of this project is to provide a platform that facilitates the exchange of ideas and promotes community as well as raises awareness of the value of local content. As such this project also has a strong promotional component and ties into the over all brand building efforts for CATS and the PEG mission.

Cost: N/A – can be supported by proposed infrastructure and be folded into normal web site development process

CATS as Enabler of Quality Campaign / Brand Building – Advisory

After the successful implementation of the key operational and technical changes proposed in this document CATS should use both its WEB and TV outlets to communicate clearly the benefits available to the community and public producers from its improved operations.

Quality training to facilitate compelling story telling and self-expression by public producers as well as access to professional equipment and personalized support should form part of these communication/promotion efforts. Outreach into schools and also to IU students currently not catered for by WTIU's program policies should be included in this process.

The promotion of the anthropological value of its archive as well as CATS's role as an enabler of transparency in local government should all be highlighted as part of on-air promos and web based communications.

CATS should capitalize on the more diverse communication habits of various demographics and incorporate contact initiation tools as part of its new website to encourage new connections with potential local content producers. This could be a contact request form or potentially even a live chat feature with selected staff. Every element should be geared towards breaking down any potential barriers to involvement and actively seek to recruit new contributors to CATS.

When promoting its output CATS should also be engaging social networking tools such as "Facebook" and "Twitter". Please refer to section 4 of this report for further suggestions.

Lastly, CATS should also consider reaching out to Comcast and actively promote particularly high quality content items for free (branded) conclusion in Comcast's VOD service.

A communication savvy staff member with good networking skills might be best placed to co-ordinate and lead this marketing and brand building effort. Currently such a function does not specifically exist, but its creation (subject to the HR constraints within the MCPL system) would represent an excellent staff development opportunity and help increase public awareness and appreciation of the PEG mission and the CATS access center, thus helping strengthen its long-term position in the market and community.

NOTE: A stronger CATS with a higher profile in the local community might also be able to leverage this social capital to improve its relationship with Comcast and other content carriers. The current almost adversarial relationship, across most regional US markets, between PEG channels and content delivery platforms seems like an anachronistic left-over from the capital intensive days of fully analogue delivery infrastructures. Increased awareness and leveraging of the value of local content and audience engagement might create long-term benefits for both parties. A strong brand identity and competent marketing (to carriers and audiences alike) by PEG operators would have to form an integral part of this transformation.

Cost: N/A – Could be delegated to existing staff and be offset against workload reductions due to improved operational efficiency

Change Communication Program – Advisory

Clearly communicate the nature, reasons, benefit and timeframe of changes within CATS to all levels of staff and be receptive to feedback and concerns. Set clear goals for everyone involved in the transformation effort and situate their role in the bigger picture.

Based on the recommendations contained in this report CATS may execute a range of technological and operational changes in the coming months. The organization is carried by a number of very motivated and committed individuals and displays a healthy cooperative culture.

To maintain any momentum created by the work presented in this report clear communication and leader ship by example on management's part will help build acceptance through the organization. (Kouzes and Posner 2007, CH 4, 9). Examples from the management literature seem to confirm that technology in itself is

merely “an accelerator of change and not a creator”. The motivation and quality of the people enabled/empowered by it, is the key success factor in good transformations (Collings 2001, CH 7, 8).

Cost: N/A

Sample Workflows

Public Access Program (proposal to transmission)

- Public producer initiated contact with CATS through phone call or contact form on CATS website
- Meeting for initial training is scheduled
- Public producer’s first meeting with CATS staff
    - Library card / ID is verified
    - Patron account created with FCS, training wiki and basic network access
    - Program proposal captured electronically and stored as part of FCS project file
    - Basic “hands-on” training with operational staff occurs
- Camera kit is scheduled as resource through Open Directory
- Camera kit is collected at CATS by public producer
- Public producer shoots program. (Telephone support with equipment features provided if/as needed)
- Camera kit is returned
    - All footage shot is ingested from media cards into FCS to patron’s (public producer) account
    - Camera is checked and charged
    - Media cards are formatted
    - Resource booking is cancelled if returned early
- Public producer edits program
    - Support provided face to face or via iChat
    - Staff occasionally monitor progress remotely on FCS
    - FCS flags inactive project
        - Staff initiate follow up call / support to re-engage public producer
    - Producers marks program as finished (may export final version for personal use)
- Staff member reviews finished project on FCS (If alterations necessary edit process re-iterated)
- Staff approves and archives project
    - APS basic record created
    - Automatic export to APS (see archive ingest workflow for encoding and review process steps) and playout server as needed (the latter is only relevant for urgent / time critical content)
    - Use program proposal with review to create synopsis
    - Archiving of relevant project files and documents on APS
    - Program become available for scheduling
    - Web-version automatically encoded
    - Program becomes available for search and viewing via catstv.net
- Program is scheduled for transmission
    - APS records updated as needed
    - Export process to video server initiated
- Transmission playlist is consolidated if necessary
- Program played to air

Archive Ingest Workflow

- Retrieve tape from archive shelve
- Use APS to retrieve metadata set transferred from old archive system
- Check tape label against APS records for consistency
- Load tape into VCR at capture station and ingest program using FCP or Final Cut Express (FCE).
    - Adjust APS program length record or content description/synopsis as necessary
    - Trim pre-role as needed
- Export uncompressed file from FCP for FCE and set up compressor encoding job based on pre-defined APS ready encoding profile / Check output filename
- Compressor encodes broadcast resolution version
- Compressor encodes web streaming version

- Finished files are moved into APS watch folder
- APS automatically (based on file name) ingests two compressed files and associates them with existing metadata record
- APS marks program record for review
- Operator reviews ingested copies for quality and correct association
    - If approved, APS record flagged as complete and program is now available for web search and playout scheduling
    - If denied, APS record reverts to recapture queue. At this point operator should perform quick diagnostic and resubmit tweaked compressor job if rejection was due to quality. If file naming was incorrect search watch folder for correct file and manually associate with correct record
- If APS record failed to find any file, job will remain in open capture queue until completed
- After approval APS will delete relevant file from watch folder
- Compressor (clients) configured to clear process files and delete input files automatically one week after job was initially submitted

These following two workflows are derivatives of the two above.

Newly Donated Pre-produced Content

Follows same workflow path as Archive Ingest with the exception that initial APS record is manually created rather than already present (from old archive system migration).

Ingest may include compliance editing and audio processing / adjustments followed by relevant APS updates.

Government Meeting

Follows same workflow path as Public Access Program creation from the point of the editing process forward.

Government meetings may have different metadata requirements compared to public access content. The nature of which will depend on the work by the CATS and CoB Metadata Working Group.

APS record may be created by the time a recording request is scheduled.

Material could be ingested automatically to server (FCP) through a live capture station or via delayed tape ingest as needed.

Schematic Content Flows

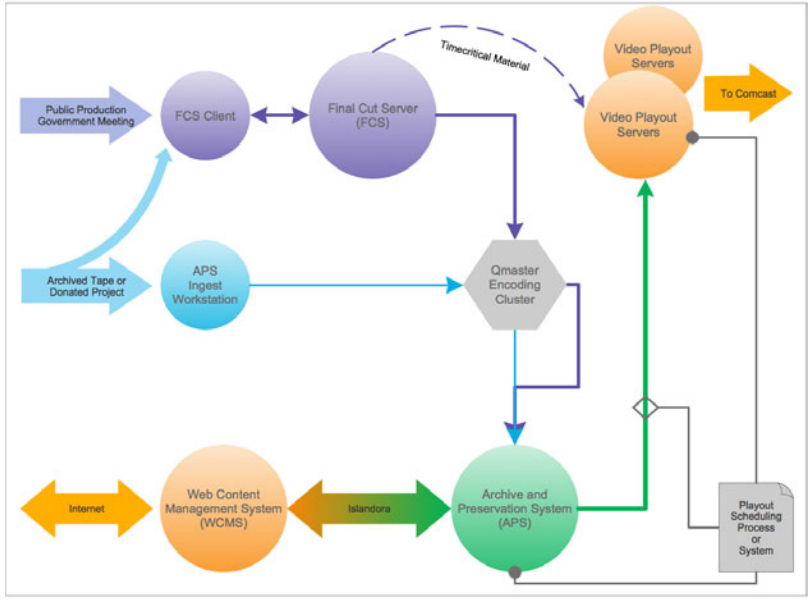

Figure 9 Schematic Content Flows in the Proposed CATS Production Environment

Implications of Investment on General Budget

The following analysis assumes a phased implementation of the recommendations contained within this document. Since all recommendations for the CoB are either without significant cost or may be accommodated by existing processes or resources no specific calculations are included herein. All further analysis pertains to CATS and its operations as defined by its 2010 draft budget.

To contextualize the following calculations please also refer to the overall implementation budget as well as the suggested high-level implementation timeline both presented further below in the appendix of this report.

Assumptions

Cash contributions by funding partners are non-reverting. However, based on the projected short term investment needs and given CATS's status as a department of the library it is assumed that any provisional budget surplus will be spent by the end of each year and will not be accumulated and carried forward across fiscal periods.

All calculations assume that the funding level of CATS and its staffing expenses remain the same over the calculated time frame. This is a simplification of the assumption that increases in funding, through increases in cable revenue, will at least cancel out if not outpace any pay increases for staff.

All calculations assume that the majority of recommendations within this report will be implemented over the coming two years. The one exception to this is the potential implementation of "phase 2" of the automation and scheduling upgrade which would see CATS switch to a fully automated and largely unattended playout operation.

Some items such as the de-activation of the sprinkler system or upgrades to the UPS capacity will potentially carry a cost. The cost could not be reliably predicted or calculated within the constraints of this report. The implementation budget in the appendix carries a note such as TBD against such items. These items have been excluded from the budget calculations herein.

Due to the high level or indicative nature of this budget, line items have not been adjusted for inflation. Neither have any cost savings for commodity hardware been included that may occur as a result of technical innovation. Such calculations should be undertaken in more detail as part of any diligent implementation planning and project definition work undertaken by CATS prior to executing the recommendations of this report.

The main project areas for year 1 encompass:

- FCS
- IT upgrades and standardization
- APS
- WCMS

The main project areas for year 2 encompass:

- Further cross system integration
- Launch of additional online services
- File/server based playout to Comcast
- Incremental storage upgrades

The main project areas for year 3 encompass:

- Network-TV style scheduling and playout
- Incremental storage upgrades

The cost/value of internal labor has been excluded from all calculations and as such most operational changes are assumed to be cost free. A split between operational and capital expenditure has been provided defining the annual cost of training resources and support contracts (where applicable) as operational expenditure.

Implementation Cost by Year

The total cost of all valued recommendations within this report is $153,081 excluding reoccurring *annual outlays*. (Please refer to appendix for line items)

Based on a phased implementation outlined above the breakdown is as follows:

Year 1

Investment	Annual Outlays		Total
$39,196	$6,804		**$46,000**
Of which	**CapEx**	**OpEx**	
	$34,946	$11,054	

Year 2

Investment	Annual Outlays		Total
$45,385	$6,804		**$52,189**
Of which	**CapEx**	**OpEx**	
	$46,135	$6,054	

Year 3

Investment	Annual Outlays		Total
$68,500	$12,804		**$81,304**
Of which	**CapEx**	**OpEx**	
	$69,250	$12,054	

Funding Proposal

Based on the 2010 draft budget provided by CATS there is currently an un-allocated reserve within the budget of approximately $31,000. Furthermore the budget contains provisions for capital expenditure of $55,000 for equipment and $10,000 for software.

Assuming that there is a certain degree of overlap between the $65,000 of budgeted capital investments and the recommendations in this report, outlays in year 1 and 2 two could be funded by requisitioning the un-allocated reserve and then funding the remainder out of the capital expenditure allocations of the existing budget. This may require some small sacrifices or re-prioritization on the part of CATS but over all seems to put the recommendations (for year 1 and 2) within this report firmly within CATS's reach without the need for significant additional funding.

Lastly, based on the actual expenditure figures provided by CATS for some of its operational outlays presented in Table 3 below additional funds could be mobilized.

	2008	2009
Videotape	$17,650	$12,155
Equipment	$43,948	$40,408
Video Materials	$9,791	$11,175
Software	$636	$2,019
Repairs	$2,906	$5,276

Table 3 CATS Select Actual Operational Outlays

As an almost tape-less production environment becomes reality, based on the FCS deployment, digital storage through the APS and file based acquisitions through solid-state camcorders, past savings on tape cost could increase further, potentially freeing between $10,000 and $15,000 per year.

Cost Benefit Statement

Most recommendations in this report either create capabilities to help CATS maintain its relevance for the local community or deal with technological transitions that necessitate upgrades due to the end-of-life status of existing infrastructure. As such these investments are likely to unlock a host of intangible benefits that cannot be adequately quantified by conventional analysis. In other instances service continuity or access to historical content is at risk and thus forces upgrades upon CATS for operational or social reasons. The latter is particularly true in case of the APS and the need to preserve an anthropologically valuable archive of locally produced content.

In such instances the recommendations in this document aim to solve these issues in the most cost effective way feasible by utilizing commodity hardware, repurposing existing equipment and deploying open source software wherever possible.

However, the "phase 2" of the scheduling and automated playout recommendation cannot claim exemption under any of the above conditions. It also represents potentially the largest capital outlay and a significant increase in annual support/licensing costs for CATS. Improvements in MCR technology through server based playout and adaptation of existing systems should enable CATS to continue operations based on current staffing levels without the need for a systems upgrade such as proposed by "phase 2".

Thus the only way such an investment could be justified within this context is against reductions in labor cost, i.e. a reduction in the number of staff hours for master control operators. If such a system would allow CATS to operate its playout largely unattended and this would result in a reduction of master control staff by 50% then such an investment might potentially save money after 4 years (see Table 4).

This statement is based on the assumption that a 30% labor cost reduction can be achieved in the year of implementation and then 50% thereafter. These savings decrease by 5% per year due to overall increasing labor cost.

The outlay for the automation system is assumed to occur at the beginning of the first year whereas annual license and support fees are due at the end of every year thereafter.

The discount rate was assumed to be at 5% based on subjective evaluation pitching it against the cost of government borrowing and inflationary pressures.

	current cost				
MCR staffing	*54,406*				
Discount rate for NPV	5%	Y0	Y1	Y2	Y3
Assumes savings diminish at 5% pa		$16,322	$25,843	$24,551	$23,323
Automation CapEx and fees		-$60,000	-$6,000	-$6,000	-$6,000
Staff savings at **end** of year		$16,322	$19,843	$18,551	$17,323
	NPV	$3,819			

Table 4 Scheduling and Automation Project, Phase 2, NPV

Conclusion

CATS should be able to immediately commence implementation of the recommendations contained within this report. With diligent and proactive project management it should be possible to achieve a full implementation from exiting funds without the need for increased outside funding.

The implementation of an advanced scheduling and automated playout environment should be delayed until year three and then scrutinized against potential future price reductions for such software products as well as actual achievable labor savings.

High-level implementation Timeline for Years 1, 2 and 3

A suggested high level implementation timeline can be found in the appendix of this report. Project durations are rough estimates and do not assume full resource utilization. Please consider the timeline as a rough guide for how long it should take to accomplish the implementation of specific key recommendations and projects contained in this report if undertaken during the course of normal operations at CATS.

Please refer to the implementation budget in the appendix listing major project dependencies for a more detailed perspective on interdependencies.

This timeline may not include all future projects. Please refer to the most recent version of this document as necessary.

No specific timeline exists for years 4 and 5, as these years would mainly see CATS leverage its newly created capabilities for the benefit of the community. CATS would also use the WCMS based infrastructure for packaging and promoting content through various online service options outlined in section 4 of this report.

Audience and Users